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Electrical World

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In this Issue

Featuring a 16-page

Manual of Priority Procedure for Conversion Lighting

Typical of plants needing improved lighting for the precision of 24-hour war production

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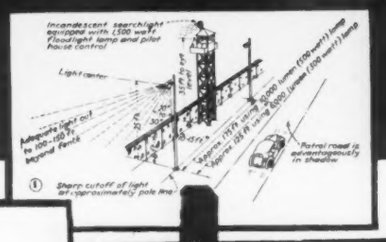
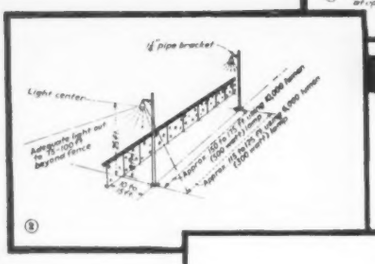
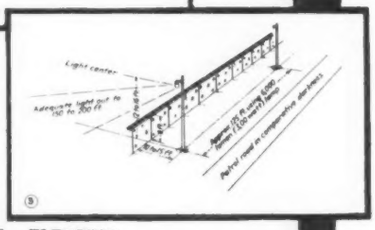

Incandescent searchlight equipped with 1500 watt floodlight lamp and pilot house control
Light center
Adequate light out to 100-150 ft. beyond fence
Sharp cutoff of light at approximately pole line
Patrol road is advantageously in shelter





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July 11, 1942

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Realism

Realism was probably never better defined than by the old negro who was in prison for doing something for which his lawyer told him they couldn't put him in jail. His well-known answer was, "Well, maybe so, boss, but here I is."

The great difficulty of American business men during the past decade is that they have thought as the lawyer and not as that old negro. They have been too conscious of their rights as previously defined, not appreciating the fact that reality and right, be it legal or ethical, are not necessarily synonymous.

It is but natural for one to fight against any usurpation of one's rights and we would be a spineless people if we didn't. In fact, as a nation are we not at war fighting a reality in Europe and Asia that does not measure up to our standards of right?

When, however, as an individual or as a business we elect not to accept a current reality we must be prepared to offer an active defense that will bring a quick decision or else be prepared to endure constant ravaging, even to the point of collapse, if we choose the path of passive resistance.

There are still in America business people who pin their hopes for release from the realism that has been building up during the past decade in a new political administration. The trend of goverrnment, unfortunately, is seldom to remove any regulation.

In the past few years regulation has taken many radical turns in the matter of labor, interstate commerce, rate bases, yardsticks and holding companies, some of which are gradually being decided by the Supreme Court. As the decisions came out a lack of confidence in the Supreme Court as now constituted grew to the point where business men appeared to be willing to be pushed around to a greater extent before seeking trial.

If one is unwilling to seek legal determination, then one recognizes the reality of the situation, and instead of continuing to live under an increasing pressure from unfriendly regulation one might better find out exactly what has to be done to get in the clear and then do it, whether it involves corporate reorganization, labor organization, federal regulation, or theories of valuation.

This is not a defeatist attitude, but one of realism—and there is a big difference. We say fight just as long as there is any reasonable chance of winning, but we also say that a patient is in no position to argue with the surgeon, for common sense tells us that living with one leg, for most of us at least, is better than not living at all.

Business has lost certain rights and will probably lose more. The important thing, therefore, as we see it, is what methods will enable business to live and contribute to the welfare of the country under these regulations.

There is a future for private business in this country, but it won't be any return to the "good old days," no matter who is elected. It depends entirely upon how sincerely business is willing to face facts and upon that realism build a sound financial and operating structure.

Temperature Coordination of Relays and Fuses

Success in transmission line operation in connection with induction overcurrent relays and fused transformer taps influenced by matched temperature characteristics — Typical cases analyzed

M. R. HOWELL, Jackson & Moreland, Boston, Mass.

SUCCESS or failure of carefully prepared co-ordinations of transmission line relays and fused transformer taps can depend on the consideration which the engineer has given to matching relay and fuse temperature characteristics. Failure to consider this factor may be the reason why some engineers have a biased opinion against the success of such co-ordinations. Today more than ever before it is important that transmission line power loads be protected against interruptions caused by a fault on a fused tap.

The inverse time over-current relay is very adaptable to co-ordination with fuses, since both are current devices. The effect on the relay of changes in ambient temperatures should be considered in the relay specifications. This is particularly true in geographical locations subjected to wide temperature variations.

It is not generally recognized that a decrement in ambient temperature causes a decrement in operating time of some overcurrent relays and an increment in operating time of others. A decrement in ambient temperature (Fig. 1) always causes an increment in the melting time of the fuse link. With this in mind it is obvious that a relay having characteristics similar to the fuse characteristics for changes in ambient temperature will give the most satisfactory results in relay and fuse coordinations. This is particularly true where the relay is in an outdoor substation or a section of a station which is not heated in winter and is on the power source side of the fuse installation.

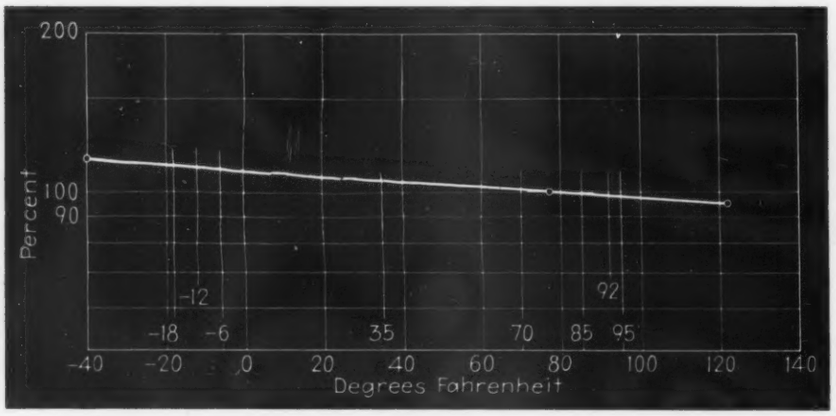


FIG. 1—Melting time of silver link fuses in percentage of published time-current curves. No preloading. Three points (at —40, +77, +122 degrees) are from data in Schweitzer & Conrad Bulletin No. 218

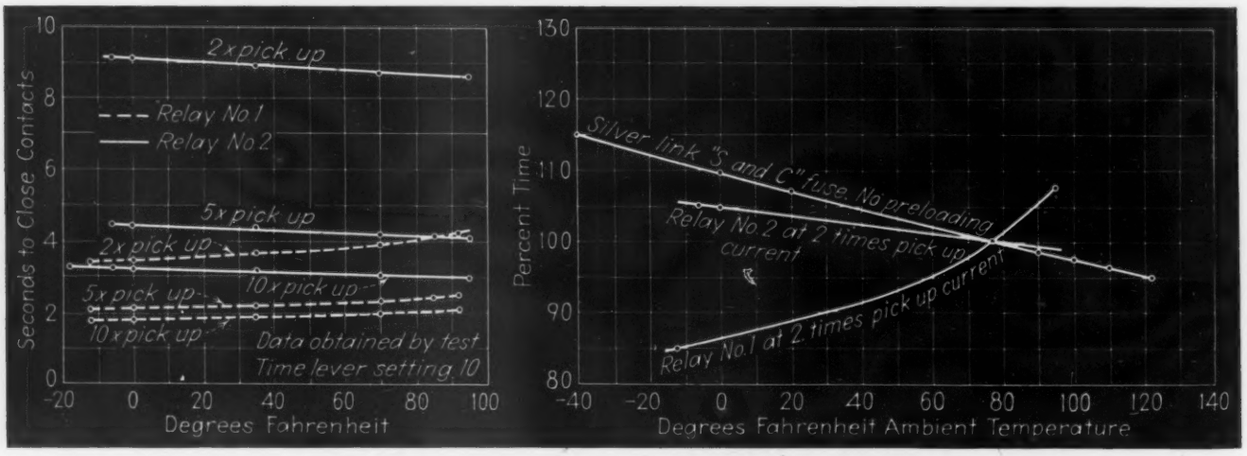

Seconds to Close Contacts
2x pick up
Relay No 1
Relay No 2
5x pick up
2x pick up
5x pick up
10x pick up
10x pick up
Data obtained by test
Time lever setting 10
Degrees Fahrenheit
Percent Time
Silver link "S and C" fuse. No preloading
Relay No 2 at 2 times pick up current
Relay No 1 at 2 times pick up current
Degrees Fahrenheit Ambient Temperature

FIG. 2—Operating time in seconds for multiples of pick-up current at various temperatures (left). Fig. 3—Melting time for fuse and contact closing time for relays in percentage of published time curves, without pre-loading (right)

In Fig. 2 the operating time in seconds is given for three multiples of pick-up current at ambient temperatures ranging from —12 deg. F to 95 deg. F. Relay No. 1 has inverse, definite-minimum time characteristics. Relay No. 2 has inverse time characteristics over a wide current range. The values given were obtained by careful tests under controlled temperature.

By choosing a base temperature of 77 deg. F. and considering the manufacturer's standard published time-current curves as giving 100 percent time values, the percent time change caused by changes in ambient temperature may be determined by referring to Fig. 3, for a silver-link fuse and for the relays at double pick-up current. Relay and fuse coordinations are often close at 1.5 to two times relay pick-up current.

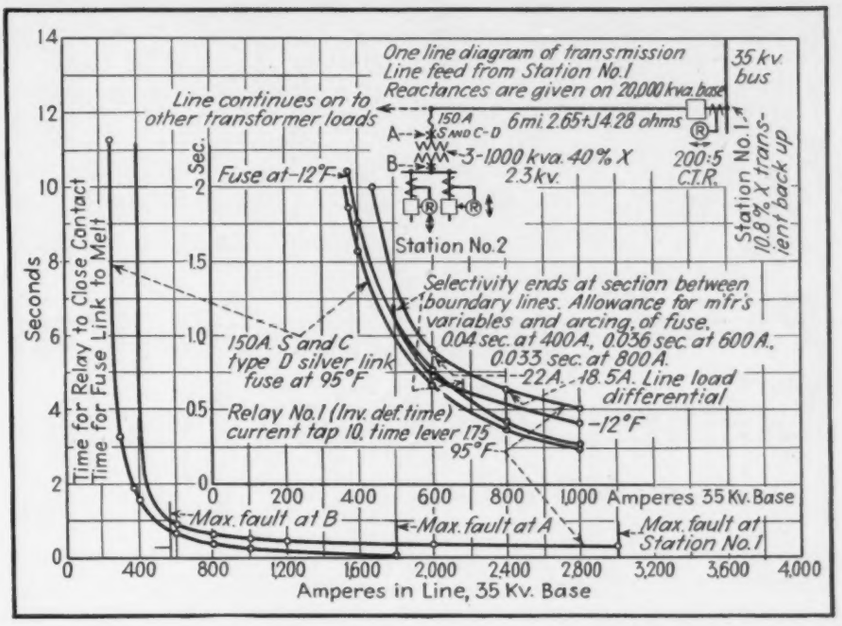

One line diagram of transmission Line feed from Station No.1 Reactances are given on 20,000 kva. base
35 kv. bus
Line continues on to other transformer loads
150 A S AND C-D
6 mi. 2.65+J4.28 ohms
3-1000 kva. 40% X 2.3 kv.
200:5 C.T.R.
Station No.1 10.8% X transient back up
Station No.2
Fuse at -12°F
Selectivity ends at section between boundary lines. Allowance for mfr's variables and arcing of fuse. 0.04 sec. at 400 A., 0.036 sec. at 600 A., 0.033 sec. at 800 A.
150 A. S and C type D silver link fuse at 95°F
22 A. 18.5 A. Line load differential
Relay No.1 (Inv. def. time) current tap 10, time lever 1.75
-12°F
95°F
Seconds
Time for Relay to Close Contact
Time for Fuse Link to Melt
Sec.
Max. fault at B
Max. fault at A
Max. fault at Station No.1
Amperes 35 Kv. Base
Amperes in Line, 35 Kv. Base

FIG. 4—Coordination of fuse and relay at 95 deg. F. for phase faults under conditions of too limited selectivity. Relay No. 1, inverse definite minimum time

Typical Problem Studied

At the top of Fig. 4 is a one-line diagram of a hypothetical transmission line section. The complete coordination curves for the inverse definite-minimum time overcurrent relays at outdoor station No. 1 and the liquid-type silver-link fuses at station No. 2 are also shown in this figure with an enlarged section of the closely coordinated portion of these curves. For illustration purposes it is assumed that the relays are timed by test and the coordination developed at an ambient temperature of 95 deg. F. It is also assumed that back-up requirements are such that as low an operating time as possible is desirable for line faults near station No. 1, thereby making close coordination necessary between the relay and the fuse.

The allowance for manufacturers' variables and for arcing was derived by comparison of melting time of fuse ratings recommended in the "Coordination Chart" published by Schweitzer & Conrad in 1938 for its type D fuse, and not from the curves in its Bulletin No. 218, which do not apply to the type D fuse. Time selectivity between fuses, equal to or greater than these time values, is considered satisfactory. On this basis the time selectivity between the relay and fuse indicated in Fig. 4 for 95 deg. F. would be considered conservative.

Curves indicating the timing for an ambient temperature of —12 deg. F. at the same relay settings are also presented. With this ambient temperature the timing of the relay is shown to be less than the limits will permit for selectivity, over a portion of the curve. With fault currents of values included in this portion, the relays at station No. 1 and the fuse at station No. 2 would both operate, thereby interrupting the service to the entire transmission line.

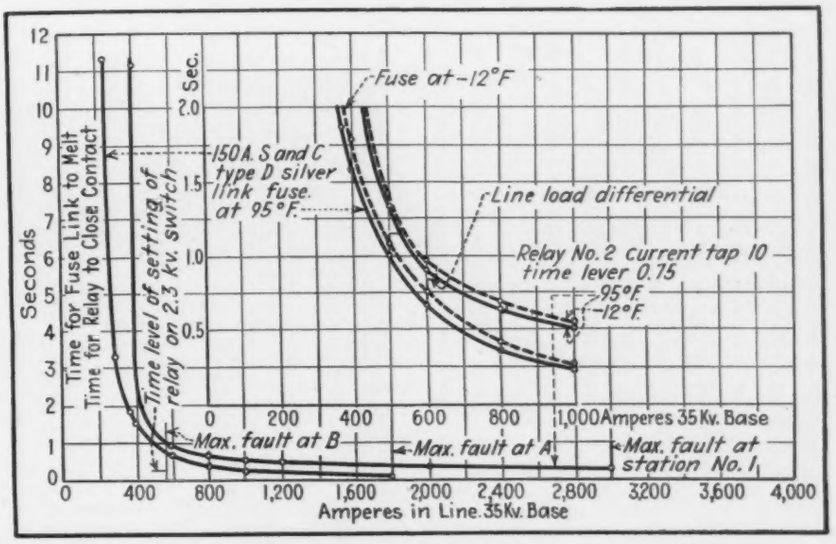

Fuse at -12°F
150 A. S and C type D silver link fuse at 95°F.
Line load differential
Relay No. 2 current tap 10 time lever 0.75
95°F.
-12°F.
Time level of setting of relay on 2.3 kv. switch
Seconds
Time for Fuse Link to Melt
Time for Relay to Close Contact
Sec.
Max. fault at B
Max. fault at A
Max. fault at station No. 1
Amperes 35 Kv. Base
Amperes in Line, 35 Kv. Base

FIG. 5—Coordination for satisfactory service on transmission line represented in Fig. 4 Relay No. 2 inverse time over a wide current range. Coordination at 95 deg. F., solid lines; at minus 12 deg. F., dash lines. Selectivity at all temperatures. Allowance for manufacturing variables and arcing of fuse, 0.04 second at 400 amp., 0.036 second at 600 amp., 0.033 second at 800 amp.

Preloading, or other ambient temperatures within the temperature range covered, would cause a smaller unfavorable change from the coordination at 95 deg. F.

The above proves that the relay used is unsuitable for coordinating with a fuse.

Fig. 5 illustrates a coordination for the same transmission line, but using overcurrent relays at station No. 1, which have inverse time characteristics over a wide current range. Assume that the relays are timed by test, and the coordination developed, at an ambient temperature of 95 deg. F. Using the same allowances to

cover manufacturing variables and arcing as were employed for the fuse in Fig. 4, a satisfactory coordination is illustrated by the curves in Fig. 5. Curves indicating the timing for an ambient temperature of —12 deg. F. at the same relay settings are also given. A selective coordination of the relay and fuse is indicated at all fault current values for the ambient temperature of —12 deg. F.

It is obvious that the coordination will remain selective with preloading or at any other ambient temperatures within the range covered. The relay and fuse have well-matched time-temperature characteristics.

The characteristics of the relay used in the coordination shown in Fig. 5 are very suitable for relay and fuse coordinations. It is apparent that matched temperature characteristics can also be important in the close coordinations of relays.

Pre-wound Stators Cut Losses in Older Units

Factory-built and wound cores installed in utility plant generators in twelve to 34 days — Service interruption shortened

B. H. SMITH, A. C. Generator Engineering Department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

THREE turbine-generators of the Narragansett Electric Company, Providence, have lately been modernized and losses reduced by replacing the old stator coils and punchings with new cores built and wound at the Westinghouse factory, retaining the original cast-iron frames. The generators are units of similar cross-compound machines, each rated at 23,750 kva., 90 percent power-factor, three-phase, 60-cycle, 11 kv. Depending on conditions, the jobs took from twelve to 34 days.

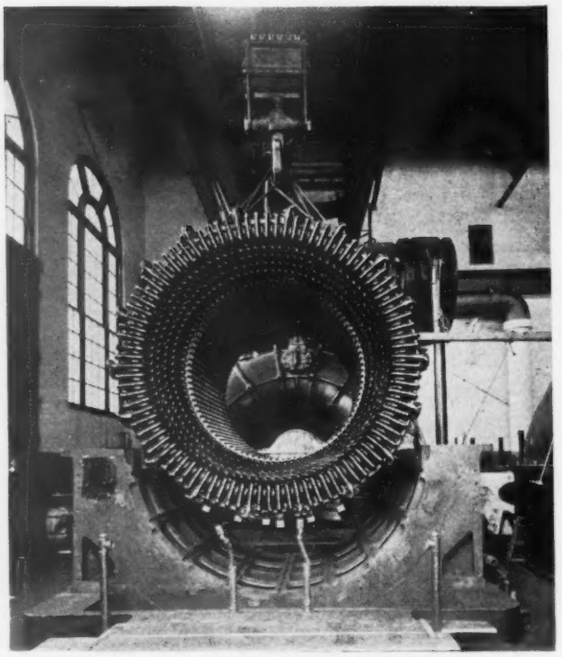
Four procedures were studied with the objective of reducing temperature rise in the stators:

1. Retreating and reinsulating punchings; supplying a few new punchings, new radial vent plates, new coils duplicating the original design, and new high-pressure fans. Stator teeth would be repunched to increase the air gap and give a short-circuit ratio of about unity. Temperature rise by thermocouple would be 70 C.; no change in rating or loss reductions was expected; factory time under prevailing conditions estimated 105 days.

2. Changes as above, but without repunching of teeth, S.C. ratio, 0.9.

3. Complete pre-wound stator; coils duplicating original design; new silicon steel punchings stacked in an inner frame with radial vent plates; new fans. No change in rating expected. Temperature rise 60 C., and S.C. ratio, unity. Estimated loss reduction, 335 kw. at no load and 400 kw. at full load for two generators of one cross-compound unit. Large core loss savings.

4. Complete pre-wound stator as in (3), except with newly designed coils having larger copper section. Stator rating becomes 30,000 kva.



LOWERING pre-wound stator into place in frame of 11-kv. generator at Narragansett Electric station, Providence, R. I.

Procedure (3) was chosen, spare coils having already been ordered for two generators (of a unit installed in 1921). The shipping schedule took advantage of the New England Power System's hydro-electric capacity available in high-water periods.

Besides the silicon steel laminations, the new stators utilize modern practice in insulation, coil treatment, bracing, glass cord, through-bolt insulation and non-magnetic vents and end fingers to cut losses. Inner frames are circumferential rings with outer diameters slightly greater than the bore diameter of the old cast-iron frames. Thus when bolts at the frame split are tightened the new inner frame is securely clamped. Heavy axial spacers are welded between the rings to form a rigid structure. Punchings are stacked on axial bars welded to frame rings. The usual design of end plates and end fingers was employed to clamp the core.

Generators were all short enough for straight radial ventilation.

Foresight in having a pre-wound stator on hand at Providence enabled one unit to be restored to service in twelve days after an interruption due to a short circuit and ground. The failure occurred on a Saturday night. On Sunday the manufacturer's service engineer at Boston was notified and a ground reported on one phase of the old stator. Also the top of the coil was found shorted into the bottom half. No damage was apparent on the end turns and the utility proceeded immediately to remove the rotor. Work was organized on a 24-hour basis to substitute the pre-wound stator.

Stripping the stator coils and removal of slot insulation was completed by Tuesday p.m.; laminations were all removed by Thursday a.m., after which the stator and keyways were cleaned. The new stator was brought to the plant and cleaned. On Saturday the pre-wound stator was put in position; stator keys and wiring around the frame were installed, and the following Monday keys were welded, cross-connections soldered and taping begun. Taping was finished at midnight on Wednesday. New blowers had been installed on the rotor, which was placed on Thursday. A cut off the blower shields was required to reduce width. This was done and end bells put on Friday, and the machine went on the line at 5 p.m. that day. This restored the large unit to service, as both generators comprising the electrical end were out of commission during the repair period.

Crane Pulls Laminations

The job took about 1,200 man-hours, of which the utility provided 350. In this case a section of laminations about 0.5 in. thick was separated and pried out from the rest of the laminations for a sufficient distance to place two steel hooks in the air duct iron (instead of removing one or two laminations at a time), one on each side of this ring of laminations. A crane pulled the laminations out of the old stator. A 30-kv. high-potential test used in the earlier replacements was omitted to save time (about eighteen hours).

These generators were built for 100 C. rise. Since 1924 the manufacturer has built such units for 60 C. rise, and no failure has been noted. The older generators have a small number of radial air ducts in the center of the machine and some trouble has been noted from swelling of insulation, with cracking at sharp corners. This difficulty has not been found with modern generators (*e.g.*, having $\frac{3}{8}$-in. air ducts). Less paper is used in stacking modern stator punchings, and the lower operating temperatures have a beneficial effect on the paper, which is installed to prevent eddy current flow.

After installation of the pre-wound stator above mentioned it was tested and delivered 15,000 kw. at 11.2 kv., the field excitation being 365 amp., power factor 68 percent and stator temperature 58 to 65 C.

Barriers Found Best for Bomb Protection

BERNARD HOGBEN, Technical Journalist, British Government

IN CONSIDERING SCHEMES for protecting the machinery at generating stations it soon became evident to the experts that little could be done against a direct bomb hit. Precautions were, therefore, taken to limit the extent of possible damage.

Around the turbines massive blast-proof walls were erected, about 12 ft. in height. Narrow catwalks were provided to give easy access to the machines, and in some stations steel arched roofs were built. Experience showed, however, that this kind of roof kept in the heat without adding appreciably to protective qualities.

Segregation of all individual machines and equipment has been the goal at which the experts have aimed. Blast and fireproof walls have been built, so that if one machine has been knocked out of service damage was limited, so far as possible, to the one component.

Each piece of switchgear has been isolated from its neighbor by fireproof walls and provision made to run off the oil in case of fire. Cable ends have been protected by brick and concrete walls and oil stores protected in a similar way.

The tremendous expense involved in all this work has carried a 50 percent government grant, although in the case of some undertakings a committee of the industry is empowered to recommend increases up to 100%.

Other precautions involved the bricking up of windows, removal of glass from roofs and fanlights and provision of fire-fighting appliances. Staff had to be trained in ARP and fire duties and emergency rations held ready against any eventuality. The cost was borne by the undertaking.

Object of all the schemes that have been tried during the last three years has been to secure that when a turbine was put out of action others in the same plant could carry on. The precautions have enabled this essential work of supplying electricity to be carried on at all times, and the national and individual preventive methods have proved that it is possible to limit damage to a far greater extent than was first anticipated.

Control Rooms Duplicated

Large undertakings have duplicated control rooms to obviate possibility of being knocked out of service, and where such additional work has been carried out the government has helped to bear the cost.

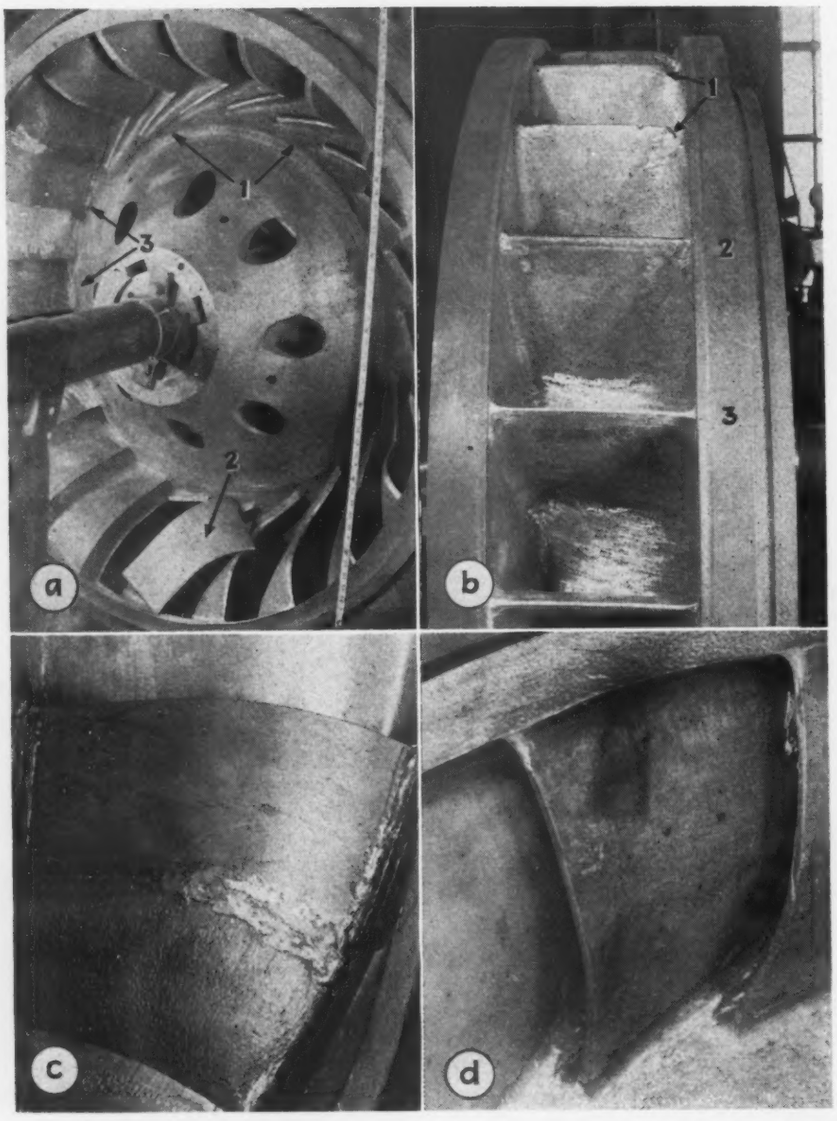
When heavy bombing first started in the summer of 1940 regulations necessitated that all but key-men should go to shelters on the wailing of the siren. Very soon the men became accustomed to the nerve strain of heavy explosions and were reluctant to take cover. Raiders overhead became the only signal for a dive for shelter, and it soon became evident that the only type of air raid protection of value must be located close at hand.

New shelters were built inside the plants, so that personnel could take cover at the last possible moment. Had the experts been able to visualize the ordinary man's reaction to heavy bombing, the expense of duplication would have been avoided.

Welding Reclaims Bronze Hydro Runner

Critical materials saved when worn runner worth $500 as scrap is arc welded at cost of $2,000 and returned to active service

GEORGE H. BRAGG, Pacific Gas & Electric Company*



PROCEDURE in the reclamation by welding
(a) Runner mounted on a horizontal mandrel for easy welding showing (1) appearance of vanes after discharge portion had been removed in boring mill, (2) a vane casting and (3) finished and unfinished welding of some of the vanes
(b) Entrance edges of vanes showing (1) worn condition, (2) semi-finished vane and (3) finished vane
(c) Close-up showing new section of vane welded in place
(d) Close-up showing completed vane after welds had been filed and ground

A BRONZE RUNNER of an 18,000-hp. hydraulic turbine on the system of the Pacific Gas & Electric Company has been reconditioned successfully and is returning profits "in the black." The vanes of this runner had been badly worn by waterborne sand which had discharged through the turbine. The wear was not uniform. Thickness of the entering edge of the vanes had not been materially reduced, but the exit edge next to the draft tube was worn almost to a "feather edge."

Weight of the runner was 5,700 lb. and a new one to replace it had been quoted at $5,510 at the time of the last price inquiry (1938). Scrap value of the worn runner was approximately $500. Examination showed that the runner could be reclaimed provided the thin portion of the vanes could be removed and could be replaced with new material of the original thickness, shape and composition of metal.

Experimental results on a single vane gave assurance that the unit could be salvaged economically. The runner was placed in a boring mill and the thin portion of the outlet edge of the blades removed to the extent shown in the accompanying illustrations. It was then transferred to a horizontal mandrel supported on two roller bearings, where it could easily be hand rotated by the welder for his portion of the work.

First operation was beveling the edges for making double "V" welds. Then a pattern of the portion of the blade that had been removed was fabricated to fit the beveled edges. Curvature and shape were according to the original design. Castings were

* Engineer of maintenance.

then made of the same alloy as the parent metal—88-10-2 bronze.

Actual welding or brazing of the cast vane sections to the runner calls for skill on the part of the welder as well as experimentation to determine the preferable method. Studies were made with gas and arc welding, various kinds of welding rod, technique to prevent internal strains and produce strong welds of homogeneous metal. The electric arc process was selected because in this particular type of work it has proved more successful than gas from the standpoints of strength, speed of operation and internal strains.

Two Kinds of Rod

Two kinds of rods were used—Aerisweld bronze, a shielded-arc electrode, and Anaconda "D" phosphor-bronze. The former is suitable for welding in any position, but the latter is better for "down" welding where large quantities of metal are deposited. The short seam along the hub was welded first, then the long seam along the vane, and finally the seam along the skirt or shroud of the runner. By checking the gap in the third seam frequently as the welding progressed on the first and second seams and preventing it from increasing or decreasing, the introduction of internal strains was avoided. This was accomplished by peining with a small pneumatic hammer, a common practice where progressive normalizing of the weld is imperative.

All the welding was completed on the top or accessible side of the vane before starting on the "V" on the reverse side adjacent to the previously attached vane. All the welding was done with $\frac{5}{32}$-in. diameter rods using 170 amp. at 23 volts with reversed polarity. This heat proved to be the optimum for both types of rods and for all other conditions.

When all the welding on each vane was finished the rough surface was smoothed by means of rotary files, followed by emery wheel grinders. The entrance edge of each vane was restored to the original contour by "building up" the crevices and welding a $\frac{1}{4}$-in. square bar of cast bronze lengthwise.

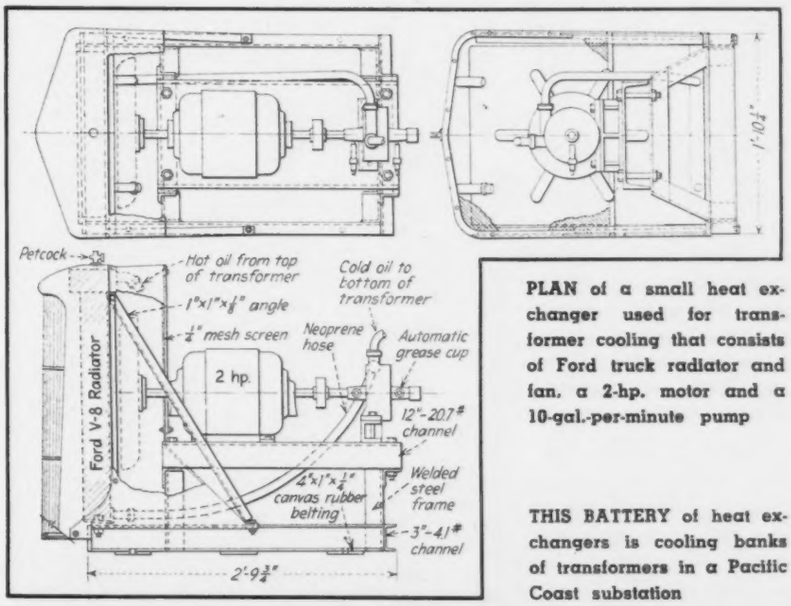
The entire job required 87 lb. of welding rod and the total cost was approximately $2,000.

Novel Heat Exchanger Cools Transformers

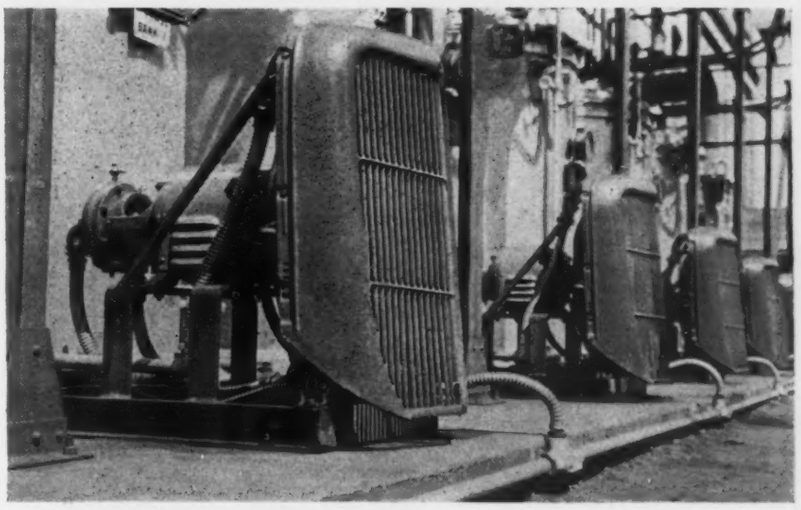
WHERE external forced cooling can be applied to transformers to increase their capacity, the novel heat exchanger developed by a West Coast utility company can be used to advantage. The apparatus consists of a Ford truck radiator and fan, a 2-hp., 1,800-r.p.m. motor and a small pump mounted on a common base. The pump is rated at 10 gal. per minute at 10 ft. head. Under normal conditions the unit will dissipate approximately 34,120 B.t.u. per hour.

Connections to the transformer are by means of Neoprene oil-proof hose. The hot oil from the top of the transformer is drawn through the radiator, which is connected to the suction side of the pump, and discharged into the bottom of the tank. The top connection provides that oil cannot be drawn down below a safe level in the event of a leak in the radiator or piping. A check valve is installed in the bottom connection in order to prevent the transformer tank from draining by gravity.

The company has 24 of these units in operation on both water- and self-cooled transformers. Also four of the units are maintained in the central warehouse for emergency use.



PLAN of a small heat exchanger used for transformer cooling that consists of Ford truck radiator and fan, a 2-hp. motor and a 10-gal.-per-minute pump



THIS BATTERY of heat exchangers is cooling banks of transformers in a Pacific Coast substation

They Sell the Company by Selling the Service

Arkansas Power & Light sends out its thirty customer service representatives (formerly appliance salesmen) and five home service girls to carry the company's story to commercial and residential customers

LET'S BE SURE our customers know all the facts and then we can rest our case on the intelligence of the American people," President C. H. Moses in essence told members of his Arkansas Power & Light organization as he inaugurated recently a new customer service program, to be conducted by appliance salesmen under the new title of "Customer Service Representative" and by the home service girls.

First step was to equip these people with up-to-date and correct information on company policies and operations. A two weeks' training school was organized and all of the key men of the company were called upon to present the story of their departmental operations. After each session an active round-table conference was stimulated and steps were taken to assure that program speakers drew freely upon charts, slides and photographs to make their presentations interesting.

Second step was a brief period of training for field work, with practice sessions (1) on methods of conducting an interview, (2) of using a specially prepared manual describing company history, organization policy and operations, and (3) on ways to prepare report forms so they would be of maximum value.

ANALYSIS OF COMMERCIAL SERVICE

Division: Southwest — Town: Blankville — Date: March 28 1942

Firm Name: DR. JOHN DOE

Address: Blankville, Arkansas. — Account Number: 11-380

Nature of Business:

RECORD OF ELECTRIC SERVICE FROM March 1941 TO March 1942 OR 12 MONTHS.
METER AAA-34-364 IS READ ON ABOUT THE 16th DAY OF EACH MONTH.

Month	KWH Used	Billing Demand	Rate Schedule	Monthly Bill
Feb	90	$2.00	GS-9	$5.05
Jan	62	2.00	"	3.79
Dec	82	2.00	"	4.69
Nov	152	2.00	"	7.84
Oct	114	2.00	"	6.13
Sept	138	2.00	"	7.21
Aug	110	$ 2.00	C-4	7.50
July	56	2.00	"	4.80
June	0	2.00	"	2.00
May	206	2.00	"	11.96
April	178	2.00	"	10.73
Mar	96	2.00	"	Incomp

HERE IS HOW YOUR LAST MONTH'S BILL IS FIGURED:

Demand Charge $ 2.00
____ KWH @ 4½ ¢ per KWH = 4.05
____ KWH @ ____ ¢ per KWH = ____
____ KWH @ ____ ¢ per KWH = ____
____ KWH @ ____ ¢ per KWH = ____
Total $ 5.05

An Average Cost of 5¢ ¢ per KWH.

Additional use of present equipment would have cost but 4.5 ¢ per KWH.

During the Past 12 Months You Have Used 1284 KWH or an Average of 107 KWH per Month For Which You Have Paid an Average of ____ ¢ per KWH, Making Your Average Bill $ 5.92 per Month or Only 19.7 per Day.

YOUR AVERAGE DAILY BILL MAY BE ANALYZED AS FOLLOWS:

Appliance or Variety of Use	Watts	Hours Use Per Day	KWH Per Day	Cost Per Day	Remarks
Lighting					
4 40watt lamps	160	7	1.1	.05	
1 300 watt lamp	300	2	.6	2.7	
2 75 watt lamps	150	4	.6	2.7	
Total Lighting	610	13	2.3	10.4	
Air Cooling					
1-2 hp	400	10	4	18.0	
Refrigeration					
Cooking Equipment					
Motors					
Totals	1010	23	6.3	28.4	

If you should require additional information about your Electric Service or I can be of help to you in any way, please call me.

Arkansas Power & Light Company
James Smith
Customer Service Representative

CROSS-SECTION OF DOCTOR DOE—Before any one of the 30 "Customer Service Representatives" of Arkansas Power & Light knocks on the customer's door he has prepared at the office this summary of that specific customer's exact monthly billing, usage, average rate and connected load. At the conclusion of the interview, a copy of this analysis is left with the customer

UP-TO-DATE, occurate and complete customer bible

Customer Service Representative (left) answers commercial customer's question about the company by reference to his copy of a carefully prepared, standardized manual which explains why, what, when and where. In every manual is a special reprint of "Public Relations for American Industry" a feature published in "Electrical World," October 8, 1938

The third step was the operation of the program, and this involved even more advance preparation for the interview. After the customer was assigned to the service representative he went to the meter book to prepare a billing analysis from that customer's actual usage and took this to the customer's home when he made the call.

Methods of using this information are described in the accompanying captions.

At the conclusion of the call the representative turns in a report of the results of the interview, copies of which are reproduced here.

The home service girls are equipped with the same company manual and direct their efforts principally to solving the problems of new customers.

ELECTRIC SERVICE ANALYSIS for residential customer

A simplified form is used when calls are made on residential customers, attention being focussed on the meter reading date and the low price at which added service through the use of added kw-hr. may be purchased

For Mr. K. JOHN DOEPLER
At BLANKVILLE, ARK. Account Number 6-0142

HERE IS A RECORD of Your ELECTRIC SERVICE From FEB 1941 to FEB 1942
a Total of ____ Months.

MONTH	KWH	AMOUNT
FEB	56	2.86
MAR	50	2.65
APR	60	3.00
MAY	78	3.65
JUNE	72	3.42
JULY	90	4.05
AUG	82	3.77
SEPT	96	4.26
OCT	86	391
NOV	70	3.35
DEC	70	3.35
JAN	90	4.05

Your Meter Is Read on About the 12 Day of Each Month.

You are Being Billed Under Rate Schedule R-4

During This Period:
Your Average Cost was 4.7 Cents per KWH
Your Average Monthly Bill was $ 3.53
or only 11.8 Cents per Day.

HERE IS HOW YOUR LAST MONTH'S BILL IS FIGURED:
Minimum Charge, _____ = $ .90
1st 90 KWH @ 3½c per KWH = 3.15
Next ____ KWH @ ____c per KWH = _____
Additional KWH @ ____c per KWH = _____
TOTAL $ 4.05
Any Use Additional to the Above Would Have Cost You Only 2½ Cents per KWH.

If you should require additional information about your electric service or I can be of service to you in any way, please call me.

Signed: James Smith
Arkansas Power & Light Company

DAILY REPORT of customer service calls

Seventy-five percent of the customers reported satisfied at the rate of 3.8 calls per man-day. Thirty-four complaints and incomplete calls to be straightened out. Forty-six high bill and rate complaints, twenty-one criticisms of the guarantee deposit policy and nineteen voltage troubles taken care of, every one previously a source of customer misunderstanding and irritation.

Mrs. JOHN I. DOESSEL

When You Tell Me How Many Hours Per Week You Use Your Appliances I Can Show You How Little It Costs You to Operate Them.

	NUMBER OWNED	HOURS USED PER WEEK	COST PER WEEK
AN IRON 2 6/10c Per Hour	1	5	13
A RADIO 4/10c Per Hour	1	20	08
A REFRIGERATOR Operating Costs Vary According to Size of Box, Use, etc.	1		35
A CLOCK 7c Per Month			
A FAN 2/10c Per Hour			
A WASHER 1 2/10c Per Hour			
A VACUUM CLEANER 1 4/10c Per Hour			
A TOASTER 1/3c Per Meal			
A COFFEE MAKER 1/3c Per Meal	1		07
A SEWING MACHINE 2/10c Per Hour			
A ROASTER 4c Per Meal			
A WAFFLE IRON 2c Per Meal			
A MIXER 2/10c Per Hour			
A SHAVER 4/10c Per Month			
A HOTPLATE 2 6/10c Per Hour			
AN ATTIC FAN 2c Per Hour			
A HEATING PAD 2/10c Per Hour			
A RANGE Varies According to No. of Meals, Amount of Use, etc.			
A WATER PUMP 1 2/10c Per Hour			

Estimated weekly appliance cost $ 1.63 is an average of only 9 cents per day or $ 2.70 per month.
Your average monthly bill is $ 3.53
Your estimated monthly appliance cost is .. $ 2.70
Your estimated monthly lighting cost is .. $ .83
Please call me whenever I can be of help to you. 3.53

James Smith
Customer Service Representative
ARKANSAS POWER & LIGHT COMPANY

THE CUSTOMER participates in this one

"Tell me how many hours of service you get from your electric servants, Mrs. Doessel, and I will show you how little it cost," says Arkansas's Mr. Smith. Note the trifling monthly costs: 13 cents for ironing, 8 cents for news and entertainment that encompasses the globe, 7 cents for coffee and 83 cents for lighting this home.

REPORT OF CUSTOMER SERVICE CALLS

RES. 0
COM'L 7

LOCATION BLANKVILLE ARKANSAS
DAY WEEK MONTH ENDING March 5 1942

NUMBER OF MEN USED	NUMBER OF MAN-DAYS		CALLS PER MAN-DAY		INTERVIEWS PER MAN-DAY	
	THIS PERIOD	TO DATE	THIS PERIOD	TO DATE	THIS PERIOD	TO DATE
1	1	60	7	3.8	4	3.2

ANALYSIS OF CALLS MADE	THIS REPORT	PREVIOUSLY REPORTED	TO-DATE
SATISFIED CUSTOMERS	4	168	172
CHANGED FROM UNFRIENDLY	0	20	20
REMAINING UNFRIENDLY OR UNCERTAIN	0	4	4
TOTAL COMPLETED INTERVIEWS	4	192	196
INTERVIEW REFUSED	0	0	0
COMPLAINTS REQUIRING FURTHER ATTENTION	1	15	16
INCOMPLETE CALLS	2	16	18
TOTAL CALLS OF ALL NATURE	7	223	230
ANALYSIS OF DIRECT SALES RESULTS			
APPLIANCES RESTORED TO USE		56	56
PROSPECTS FOR ADDITIONAL LIGHTING			
MINOR APPLIANCES			
MAJOR APPLIANCES			

ANALYSIS OF COMPLAINTS

CLASSIFICATION		NUMBER RECEIVED OFFICE	NUMBER RECEIVED FIELD	HIGH BILL	RATE	DEPOSIT	METER	ACCTING	VOLTAGE	APPLI.	RADIO	PERSONNEL	ALL OTHERS
SATISFIED BY C. S. R.	THIS REPORT		3		2					1			
	PREV. REPTS	11	118	19	25	21	10	11	19	5	14	1	4
	TOTAL	11	121	19	27	21	10	11	19	6	14	1	4
REFERRED TO OTHERS	THIS REPORT		1							1			
	PREV. REPTS		29	2	3	3	4	3	1	6	6		1
	TOTAL		30	2	3	3	4	3	1	7	6		1

COMMENTS: SHOW NAME AND ACCOUNT NUMBER FOR SPECIAL REQUESTS TO OTHER DEPARTMENTS
LIST EXCEPTIONAL OR UNUSUAL INTERVIEWS OR COMMENTS OF CUSTOMERS

Dr. ---------- 11-138---Wants fan fixed as it is in period of guarantee

Dr ---------- 11-375 wants to know percentage of increase in power lines that was rural

Approved: A.P.MITCHELL
DIV. SALES MGR.

Signed: JAMES SMITH
CUSTOMER SERVICE REPRESENTATIVE

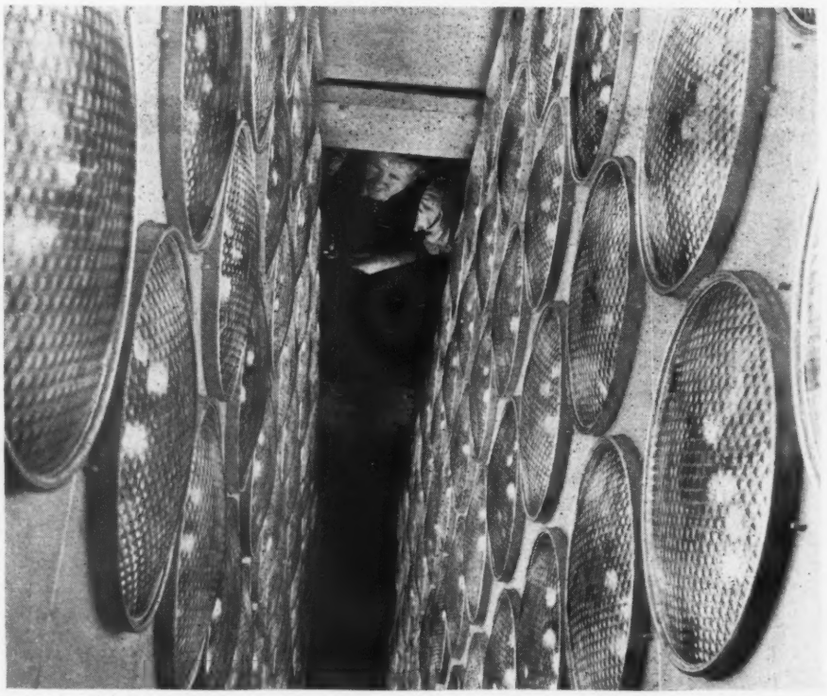
Travel for day--four miles

Infra-Red Developments Speed War Production

Radiant heat engineers utilize the convection energy formerly wasted, tackle problems caused by modified paint formulations and develop new types of ovens

PAUL H. GOODELL, C. M. Hall Lamp Company, Detroit, Mich.*

WHILE utility power engineers and production and electrical engineers of large industrial plants are well aware of the fact that infra-red heating has earned a reputation in the field of low-temperature industrial heating, many fallacies resulting from the premature announcement of infra-red have been exposed by the experiences of the last two years. For example, infra-red does not bake as the result of any penetrating qualities of its radiation. The inverse square law does not apply to radiant ovens. The output of a modern radiant lamp is not a conventional beam. Convection heat is no longer a waste product. Furnace atmospheres are not inconsequential. The commercial application of radiant heat is not the single problem of heat transfer. A potential user cannot solve his problem by experimenting solely with a group of lamps. Tunnels of uniformly arranged lamps are at best limited in their effectiveness. And, finally, we electrical people do not deserve the primary credit for the general success of radiant heating.



THREE STORIES HIGH—Looking down a "double-action" vertical oven about three stories high which is solving a textile industry war problem at the rate of 30 yards per minute. Though employing several hundred kilowatts, the savings in operating cost in one year will more than pay for the complete investment

Facts vs. Theory

What gave rise to the fallacy that the speed of infra-red is due to its heating from the inside out?

The legend in Detroit is that early experiments revealed the absence of surface skinning during drying. This indication of slower surface drying combined with faster complete drying seemed to indicate that the heat was emanating from within. At least the story possessed mystifying qualities, which for the time at least precluded the necessity for thermodynamic analysis.

Actually, we know today that the time-saving qualities of radiant heating are due almost wholly to the sustained rate of heat transfer, which is unaffected by Newton's law of temperature differential, until the energy is absorbed or converted into sensible heat. Thus, coatings, whether opaque or translucent to radiation in the infra-red spectrum, will be heated to equal degree if applied on a non-reflecting or opaque background, although temperatures on transparent or rightly reflecting backgrounds will be dependent on the opacity and absorption characteristics of the coating applied.

Thus heating cycles as customarily based on air temperature provide no indication of the schedule required under radiant heating, which may itself be directly influenced by the density or concentration of energy applied. Furthermore, the schedule for a given paint formulation will

* Manager, Radiant Heat Division.

vary in relation to the mass characteristics of the product on which it is to be applied.

It is important to note, however, that a diminishing percentage of radiant oven applications involve the baking of paints. Largely due to its time, cost and space-saving advantages, in combination with cleanliness, safety and ease of control, radiant heating is today in common use for (1) a great variety of applications where working temperatures need not exceed 500 deg. F., and (2) where suitable interception of the energy can be provided through proper handling of the products to be heated.

"Buying a Lamp"

Believing that his requirements are different from all others, the average customer, whose curiosity has been aroused by infra-red publicity, proceeds to buy one or more lamps and to start experimenting.

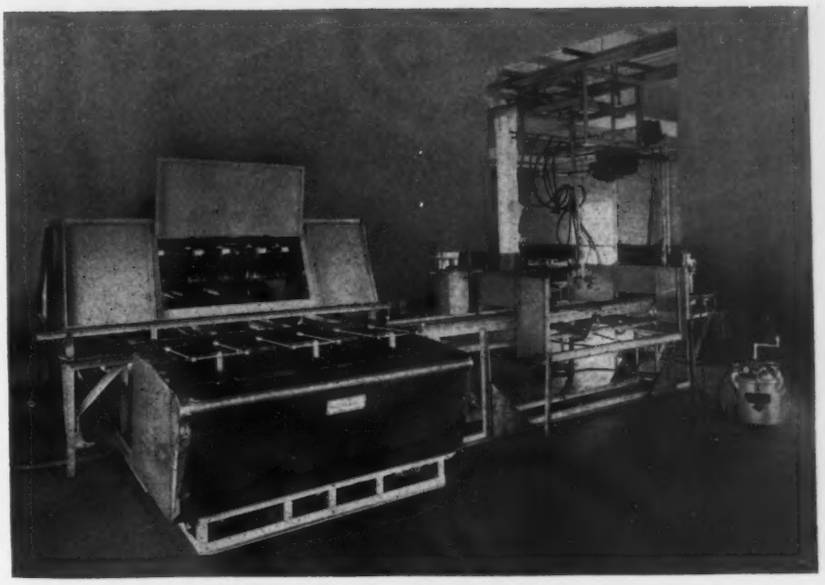
More than likely he becomes disillusioned. The temperature drops as the distance from the working plane to the lamp increases and any number of other difficulties may set in for which his amateur experiments reveal no logical answer.

The same consequence might well occur if a similar procedure were followed in obtaining a convection oven. Here the established procedure fortunately is to obtain expert advice based on the fundamental premise that heat is easy to produce but costly to apply.

Unless the customer has a better than average knowledge of thermodynamics, he may hastily reach the conclusion that his application cannot be adapted to infra-red heating. Unbiased consultation with a qualified engineer will invariably reverse this decision, provided the chemistry of the materials is suited to rapid heat transfer. Such consultation is one of the most vital services that utility engineers can provide in bringing about a unified acceptance of low-temperature electric heating from radiant sources.

Adaptability

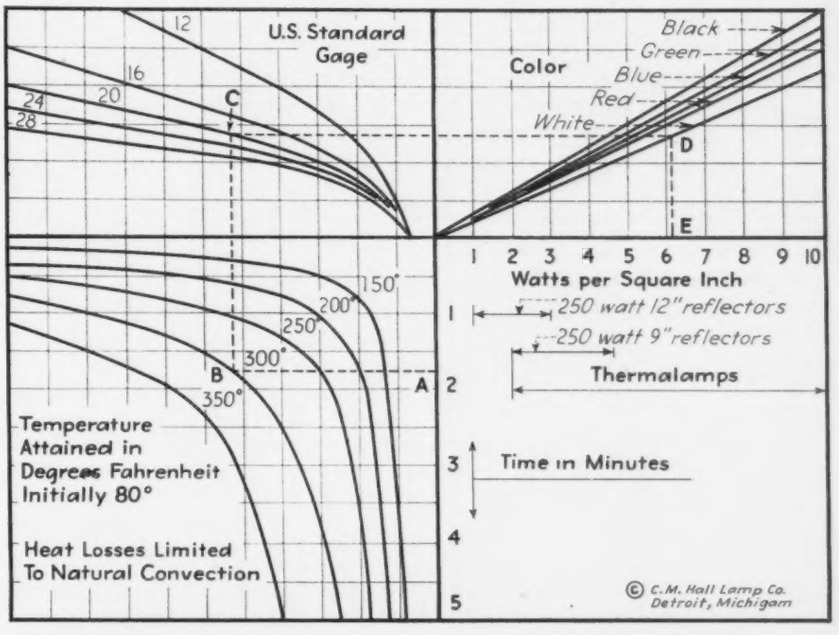
Few applications present identical heating requirements. The most common task is that of heating a variety of shapes and sizes of objects uniformly, as in the more universal all-purpose oven.



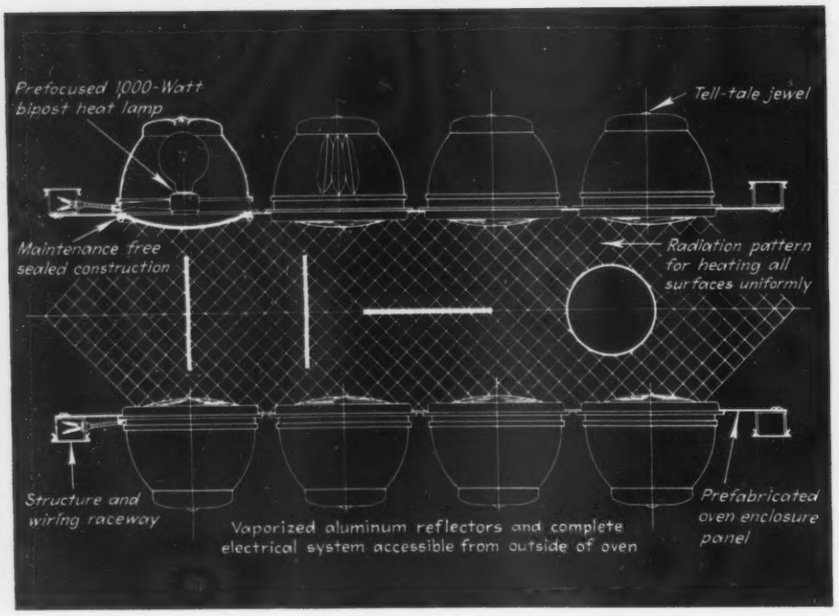
NEAT WAR PLANT STUNT—This manufacturer wanted to dry 15,000 linear feet of his product per day. Space did not permit straight-line handling. Solution: Product enters at high speed at right, is sprayed and passed to infra-red oven at left. Here product is diverted, in short lengths at right angles and relatively slow speed, to form an L-style assembly needing little space

We should not expect that three-dimensional objects may be uniformly heated without correspondingly making provisions for uniform three-dimensional control of the radiant energy. Ovens may be readily built to provide effective heat distribution on surfaces parallel to the oven walls. However, special consideration must be given to any surfaces that are perpendicular to the oven axis, as in the case of end sections on parts progressing through the oven on a conveyor.

By directing the energy in a criss-cross pattern at 45 deg. to the oven axis it is possible to approach uniform heating of any exposed surface regardless of position and over a considerable range of working dis-



FOR INDUSTRIAL PLANT ELECTRICIANS AND POWER SALES ENGINEERS—New, revised infra-red temperature conversion chart for use with new lamps. Gives time or heat density required to obtain desired temperatures under various conditions of mass and color. In example, with a density of 6.2 watts per square inch, heating a piece of 20-gage steel, painted white, to temperature of 300 deg. F. requires 1¾ minutes


Prefocused 1000-Watt bipost heat lamp
Tell-tale jewel
Maintenance free sealed construction
Radiation pattern for heating all surfaces uniformly
Structure and wiring raceway
Vaporized aluminum reflectors and complete electrical system accessible from outside of oven
Prefabricated oven enclosure panel

SCHEMATIC DIAGRAM of typical oven cross-section and heat distribution

tances, depending on the over-all size of the oven. In this way the inverse square law is nullified in modern radiant heating practice. Ribbed reflectors in combination with lenses are among the devices available to provide such heat distribution, thus avoiding customary limitations of earlier type parabolic equipment. Prefocused construction is employed to assure the proper distribution of heat at all times. Such reflector units possess the further advantage of providing uniform heat at any desired density by correspondingly varying lamp spacing and mounting height to the work in the initial oven design.

Controlled Atmospheres

Throughout the early industrial use of infra-red we all thought that oven atmospheres were of no particular importance. Reflector tunnels were accordingly used to cut initial investment cost instead of building inclosed ovens.

Today the by-product convection from heated work is usefully retained by fully inclosing ovens and employing down-draft system of ventilation. The nominal increase in cost permits convenient accessibility to all vital parts which may be located outside of the heating zone, at the same time providing improved operating economy, consistent performance summer and winter, accelerated curing of paint finishes, safe discharge of exhaust gases and more favorable balance of vapor pressure in dehydration ovens.

With the combined use of radiation and convection, predetermined temperature cycles should be most economically obtained with multiple zone ovens. For example, a four-zone oven would be particularly advantageous for baking a typical synthetic enamel.

The first entrance zone would be a preheat section. It is a convection zone with no lamps, only hot air. Reason: To preheat, improve over-all thermal efficiency, and take off high-volatile solvents.

The second zone would incorporate a high concentration of energy, using 1,000-watt lamps. Reason: To give that fast heating characteristic of radiant energy heating. The ultimate baking temperature is to be attained in this zone.

The third zone may be called a soaking section. There are lamps here, too, but they are spaced on wide centers to give a low heat density. Reason: To replace the heat dissipated through the mass of the product by reason of its thermal conductivity.

The fourth zone is the heat-retention section. Again convection only, no lamps. Reason: Economy, as the residual heat in the product itself is used to complete the job. In short, radiation is used for the initial accelerated heating, and by inclosing the oven the working temperature is sustained by convection.

A successful infra-red heating negotiation, whether between prospect and power sales engineer or prospect and manufacturer, is not completed with a determination of the thermal requirements involved. This is only problem No. 1. On many occasions the success or failure of an installation will depend upon the proper handling of two related and basic problems often not realized by the customer himself. These are: Problem No. 2—The proper handling of the product to assure maximum heat absorption. Problem No. 3—The chemistry of the product and any materials to be applied.

For one customer the vital point will be the matter of space utilization in the oven to assure economical operation. A conveyor-equipped oven should be operated at the minimum speed and the maximum loading to assure best economy for a given production.

For another customer the determining factor may be the selection of a finish which will cure rapidly and yet provide the desired qualities of protection and decoration. The rate of heat transfer or maximum temperature may be critical points on other applications. Usually the best heating economy is obtained with the minimum time cycle and the maximum face temperature.

Future of Infra-Red

Two years ago the average installation of radiant heating represented a connected load of less than 15 kw. Today, speaking for our organization, the average is above 80 kw. It is estimated that the total capacity of present installations may be as high as 60,000 kw.

We electrical people have been aware of the vast possibilities of radiant heating for many years. Up until approximately fifteen years ago the bottleneck was not speed of heat transfer. It was oxidation. Then, through advances in chemical engineering, rather than in our field, synthetic materials were developed, which were thermal setting. Oxidation has thus given way to polymerization, merely a process of molecular growth which can take place with extreme rapidity. Low-temperature convection heating promptly became a major industrial bottleneck, now being avoided by widespread use of radiant heat.

Implementing the War, Theme of A.I.E.E. Sessions

Large attendance focuses primarily on technological contributions toward adequate power capacity, cautiously overloaded and competently protected equipment, along with ingenious solutions to problems posed by a fight to perpetuate democracy

HARDLY even a winter meeting of the American Institute of Electrical Engineers has been more a working convention devoted to pressing and timely topics than the summer convention just held at Chicago, June 22 to 26, 1942. Twelve hundred members came to discuss and hear about the ways in which engineering is helping the war effort of the nation. The contributions came not only in the unusually large number of technical sessions and conferences but in the formal addresses, a broadcast over the CBS network and in the serious discussions whenever two or three met together.

WPB experts came to discuss power sufficiency, some of the implications of power insufficiency and of material shortages, and committees reported on safe limits of overloading equipment. Some technical papers showed how to get more out of existing facilities, another showed how to circumvent the cessation of flow of instrument-bearing jewels from Switzerland through Italy. There were conferences and clinics on lighting for production, on welding, on wartime pedagogy and on functioning of the Institute sections in technical service to members in the face of retricted automotive travel.

In short, it was a convention motivated by and executed for war purposes. Nor did it stop there. Evidence in hemisphere solidarity was given in a proposal from Carolos Berenhauser, Jr., a Brazilian engineer, that the A.I.E.E. establish sections in South America as well as in Mexico; R. P. Crippen (international department of Ebasco Services, Inc.) decried the acceptance in the United States of the idea that differences in temperament are a bar to mutual understanding. After presenting statistics of the status of electrical and engineering developments in South America as affected by economics, topography, climate and distance between population centers, he surmised that isolated power centers and a multiplicity of local manufacturing areas are indicated as the trend. Opportunity for young U.S.A. engineers is restricted by legal and professional prescriptions except for temporary engagements.

Power Generation

Power Supply for the War Program. J. E. Moore (War Production Board).

Power Supply for the War Program. E. Falck (War Production Board).

Power Facilities and Problems in South America. R. P. Crippen (Ebasco Services).

Frequency Control of Load Swings. J. E. McCormack and **R. T. Lombard** (both Consolidated Edison). Larger blocks assigned at less frequent intervals. Operator increases load only with low or dropping frequency and decreases only with high or rising frequency. Interchange fluctuates less. Boiler maintenance reduced.

Walker Cisler, in his dual capacity as chairman of the A.I.E.E. power generation committee and also chief consultant of WPB power branch, imparted a significant war flavor to this session. His two aids spoke largely off the record in giving intimate facts about prospective power requirements and sufficiencies, Falck outlining the principles of curtail-

RADIO ROUND TABLE—"Electricity Fights the War" was the topic of a nation-wide CBS broadcast during the convention week. Discussers are: D. C. Prince, A.I.E.E. president and vice-president of General Electric; Harry B. Gear, vice-president Commonwealth Edison; John McCormick, CBS announcer, and Brig.-Gen. Donald Armstrong, Chicago Ordnance District, War Department. At right L. W. Smith, Doble Engineering Co., and H. S. Patton, Public Service of Northern Illinois

ment should rationing become necessary. Moore emphasized the regional character of the power problem. He anticipates that difficulties will increase in delivering and erecting the capacities now in process of installation. There should be no delay in ordering even the smallest items of equipment nor hesitancy to strip the design to its barest essentials. "Washington has no desire to dictate design," but must insist on essentiality of the proposals.

Long periods of operation with little or no margin of reserve are probable, said Moore, adding that it is extremely desirable to have the operating force become familiar with and rehearse all likely eventualities so that outages will be minimized. Anticipatory inspection and overhaul should be done whenever opportunity affords, regardless of customary schedules. Tie-lines will have to hover near stability limits as all feasible capacity in isolated plants gets tied-in to carry the war loads.

McCormack and Lombard said their technique of stabilized load shifting hinged on precise knowledge of frequency trend and then described their stroboscopic frequency-drift indication controlled by the 440-cycle note broadcast by the Bureau of Standards. After they demonstrated its functioning, R. N. Slinger (General Electric) announced a new frequency meter having sharp mechanical resonance based on a 60-cycle tuning fork; frequency can be estimated to one part in 50,000 and there are two scales, 59.875 to 60.125 and 59.75 to 60.25 cycles. Concern over incremental economies can be obviated by resort to program-load control, said S. B. Griscom (Westinghouse) and it need not exclude the manual control which is always desirable no matter how complete the automatic features.

Overloading

Factors Affecting the Mechanical Deterioration of Cellulose Insulation. F. M. Clark (General Electric). Above 75 C. mechanical deterioration accelerates. Oxidation is determinant in aging below 120 C. Intermittent heating above 150 C. is additive. Mechanical life halved by each doubling of water content. Comment on 8-deg. rule of Montsinger.

Application of Apparatus and Conductors Under Various Ambient Temperature Conditions. R. E. Hellmund and **P. H. McAuley** (both Westinghouse). Substantiates permissible increases in loading for certain motors without exceeding conservative hot-spot temperatures. Discusses climatic and inclosure ranges of ambient and advocates retention of 40 C. prescription in standards.

Emergency Overloading of Air-Cooled, Oil-immersed Power Transformers by Hot-Spot Temperatures. V. M. Montsinger and **P. M. Ketchum** (both General Electric). Fifty heat runs on 2,000 to 3,125 kva. calculated. Hot-spot 5 to 6 deg. above winding average. Ultimate average and top oil rises vary as loss raised to 0.8 power on average. Water content important life factor.

Emergency Overloads for Oil-Insulated Transformers. F. J. Vogel and **T. K. Sloat** (both Westinghouse). Sets up seven classes of transformers and suggests permissible hot-spot rise, top-oil rise, loss ratio and time constant for each, along with emergency loadings for durations ¼ to 24 hours.

Motor Insulation, Heat and Moisture. P. H. McAuley (Westinghouse). Tests on two 5-hp. motors loaded for two years to 7.2 and 6.4 hp. Temperature aging difficult to detect from measurements subject to deviations due to dirt and moisture. Good correlation of insulation resistance and dielectric strength in fractionals.

Prepared for presentation and usefulness right at the present moment was an interim report of the transformer subcommittee. M. S. Oldacre, chairman, promised further data and guides for overloading of transformers and regulators, but felt it was desirable to resolve the divergent views advanced in papers at this session. Information given pertains to designs not over fourteen years old, to 55 C. rise and to daily average (rather than weighted equivalent) ambient. For normal life expectancy the loading may be increased 0.3 percent for each percent of load factor below 100, with a maximum limit of 15 percent increment. Making only moderate sacrifice of life expectancy short time emergency overloads of up to 190 percent (for self- and water-cooled) and up to 160 percent (for forced-air cooled) can be carried for one hour following full-load on 500 kva. or larger transformers. Similar data were given for smaller transformers, for other durations up to 24 hours and for lesser preceding load. Curves were provided for ready use by operators.

In comment on the Clark paper, Herman Halperin (Chicago) saw intimation of a "6-deg. rule" for the early life period of insulation, whereas V. M. Montsinger (General Electric) saw confirmation of his well-honored 8-deg. rule, although 5 deg. can be used as the index of deterioration-doubling where hot-spot is moderate (90 to 100 C.). Initial saving in cost appears uneconomical justification for 60 C.-rise designs since, on a 5-deg. rule, their life would be half that of a 55 C.-rise transformer.

McAuley emphasized, in presenting the Hellmund-McAuley paper, that it affords convincing evidence of the futility of establishing a multiplicity of standard ambients. Montsinger said that wherever there are many days, even in the warm belt, when air is well below 30 C., and if no advantage is taken of the 1 percent overloading rule, it should not be necessary to derate during the few days when average daily ambient exceeds 30 C. If ambient time period is one year it is preferable to use the equivalent annual ambient based on weighted effect of temperature aging. If the overloads are winter, use of

CRAP CONFERENCE—Discussing the national scrap campaign in an informal conference are: H. H. Henline, A.I.E.E. national secretary; C. A. owel, Westinghouse; P. L. Alger, General Electric; George Sutherland, WPB, and H. M. MacDougal, utility coordinator, Industrial Scrap Section, /PB. At right, Organization and management of large scale engineering work was the subject of the Thursday morning conference session. L. to are H. B. Gear, Commonwealth Edison; R. C. Muir, General Electric; D. C. Prince, A.I.E.E. outgoing president; M. R. Sullivan, American Tele-.one & Telegraph, and H. S. Osborn, Incoming A.I.E.E. president

N. S. Hibshman, Lehigh University; D. E. Moat and E. D. Doyle, Leeds & Northrup, with P. L. Hoover, Case School of Applied Science. In center, K. B. McEachron, General Electric, and H. S. Osborne, American Telephone & Telegraph. At right, H. W. Young, Delta Star Electric; J. E. Housley and Meade Warren, Aluminum Company of America

daily average ambient will result in greatest output, and similarly with equivalent ambient for summer.

Rectifier Applications

Electrical Equipment for Large Electrochemical Applications. T. R. Rhea and H. H. Zielinski (both General Electric). Process requirements, selection and arrangement of rectifiers and auxiliaries, decision on number of phases and d.c. voltage control for aluminum, magnesium, chlorine, copper and zinc.

Ignition Rectifiers in Industry. J. H. Cox and G. F. Jones (both Westinghouse). Station layouts, comparative rectifier switching arrangements, voltage control for large industrial installations.

Ignitor Excitation Circuits and Misfire Indication Circuits. A. H. Mittag and A. Schmidt, Jr. (both General Electric). Several static magnetic impulse circuits discussed along with detection of excitation failure.

A New Multiple High-Speed Air Circuit Breaker for Mercury-Arc Rectifier Anode Circuits and Its Relation to the Arc-back Problem. J. W. Seamon and L. W. Morton (both General Electric). Analysis of arc-back phenomenon; of four methods of protection (reactance, suppression, cathode notching, anode switching) anode switching is newest. New breaker (six-pole) designed to start line current reduction in half-cycle with up to 6,000,000 amp. per second rise-rate.

A 600-Volt Inclosed Limiter for Network Use. P. O. Langguth, H. L. Rawlins and J. M. Wallace (all Westinghouse). New design for 50,000 amp. for industrial plants where increased interrupting duty comes from shorter cable runs.

In three years electrolytic processes have raised their requirements of electrical energy from 900,000 kw. to over 3,500,000, said W. E. Gutzwiller, Allis-Chalmers, as, in reference to the Rhea-Zielinski paper, he advised that special consideration be given to continuous excitation rectifiers for large loads in this field. Discussing the Cox-Jones paper, L. W. Morton, General Electric, said that copper could be saved by larger use of steel jackets for rectifier cooling, the addition of sodium dichromate to the cooling water performing admirably as a rust inhibitor. In reference to the same paper, H. Winograd, Allis-Chalmers, declared that blocking of anodes can be considered as only a secondary, not a primary, protection.

Recalling that he had pointed out in an earlier Institute paper the possibility of misfiring in ignitron rectifiers, O. K. Marti, Allis-Chalmers, said that difficulty could be largely overcome by continuous excitation. J. H. Cox, Westinghouse, questioned the value of misfire indicators since such indications are easily apparent in the performance of the rectifier.

Switching Equipment

Transient Recovery Voltage Characteristics of Electric Power Systems. H. P. St. Clair (American Gas & Electric) and J. A. Adams (Philadelphia Electric). Six systems calculated. Few instances found where extreme rates of rise cause difficulty in breaker operation, because of ample stroke design.

Practical Calculation of Circuit Transient Recovery Voltages. J. A. Adams (Phila. Elec.), W. F. Skeats (Gen. Elec.), R. C. VanSickle (Westinghouse) and T. G. A. Sillers (Allis-Chalmers). Simplifies determination of circuit characteristics with reasonable accuracy; examples computed; tables of capacitances of manufactured transformers, breakers and arresters.

Transient Recovery Voltages and Circuit Breaker Performance. R. C. Van Sickle (Westinghouse). Reactor close to breaker creates high natural frequency in recovery voltage, but difficulty in interruption does not increase indefinitely with increase in natural frequency. Phenomena reproducible in laboratory.

Tests and Analysis of Circuit Breaker Performance when Switching Large Capacitor Banks. T. W. Schroeder, E. W. Boehne and J. W. Butler (all General Electric). Reports 338 tests. Standard oil blast breakers can switch capacitor banks up to 10,000 kva. without creating abnormal overvoltages; magne-blast successfuly interrupted 3,400 amp. at 5,350 volts (31,400 kva.).

A Compressed-Air Operating Mechanism for Oil Circuit Breakers. R. C. Cunningham and A. W. Hill (Westinghouse). Less drain on battery, faster than solenoid. Linkage mechanism and air-flow control discussed.

Calculations of transient recovery voltages result generally in values higher than are encountered in practice. This condition prompted some suggestion in the discussion of the three papers on the subject that perhaps switchgear had been overdesigned and sizes might be reduced, J. A. Elzey and W. M. Von Voightlander, both Commonwealth & Southern, contributing these thoughts. A. J. Krupy, Commonwealth Edison, said that calculations may arrive at too high values for recovery voltages, values somewhat disturbing, but not justified by experience.

Initiation in the A.E.I.C. committee on oil circuit breaker testing of the study to which the three papers are major contributions was related by W. F. Sims, Commonwealth Edison. J. B. MacNeil, Westinghouse, and D. C. Prince, General Electric, both saw the calculation methods developed in the papers as doing much to advance the development of circuit breaker design.

C. Concordia and H. A. Peterson, General Electric, said that a review of actual circuit breaker failures indicates that factors other than rate of rise of recovery voltage are generally much more significant in breaker performance for these border line cases where failures may occur. R. D. Evans, Westinghouse, uttered a word of caution to those unfamiliar with such calculations—unless the necessary approximations are permissible for the particular case, accuracy of results will be considerably reduced. Use of the recovery voltage analyzer was suggested by G. W. Dunlap, General Electric, to check the validity of assumptions used in calculations. R. C. R. Schulze, Public Service Electric & Gas, criticized the lumping of inductances done to simplify calculations which may result in loss of accuracy.

Lightning

Study of Driven Rods and Counterpoise Wires in High-Resistance Soil on 140-Kv System. J. G. Hemstreet (Consumers Power), W. W. Lewis and C. M. Forest (both General Electric). Parallel and right angle counterpoises equally effective; ground resistance the criterion. Deep rods

superior to counterpoise in high-resistance surface soil. Surge resistance may be as low as normal 0.04 footing resistance in sandy soil.

Practical Design of Counterpoise for Transmission-Line Lightning Protection. E. Hansson and **S. K. Waldorf** (Penn. Water & Power). Develops optimum footing resistance and disposition of counterpoise. Uniform low ground resistance preferable to uniform counterpoise system for flashover prevention. Comments on soil variation.

Induced Voltages on Transmission Lines. C. F. Wagner and **G. D. McCann** (both Westinghouse). Digests philosophy of strokes and streamers, gradients and voltage surges. Presents probability curve giving frequency of occurrence of induced voltages as a function of crest magnitude.

Abnormal Currents in Distribution Transformers Due to Lightning. J. M. Bryant and **M. Newman** (both University of Minnesota). Direct strokes to primary may send mechanically disruptive surges in grounded neutral rural secondary windings when primary arresters function. Tables, tests, analysis of core saturation as affecting sectionalizing fuse and breaker operations.

Effect of Lightning on Thin Metal Surfaces. K. B. McEachron and **J. H. Hagenguth** (both General Electric). Study of 150 pitmarks on copper sphere atop WSM radiator. Maximum-sized hole interpreted as 240 coulombs. Value of 240 coulombs for stroke to metal-roofed rural home.

Contrary to the Hansson-Waldorf experience, L. A. Terven (West Penn) reported no improvement from adding a continuous counterpoise on seventeen towers (having over 171 ohms footing resistance) on a 132 kv. steel-tower line running 58.5 miles through mountainous territory. In fact, the outages per 100 miles from 1938–41 were 4.7, as compared with 4.57 for the average of three non-counterpoised years; coupling of the horizontal configuration (20-ft. separation) with the two overhead ground wires (10 ft. higher and 20 ft. apart) might not be optimum.

In building the Powerton-Crawford 230-kv. line the aim was 5 ohms instead of the 10 indicated by the paper, said F. O. Wollaston (Commonwealth Edison). A composite curve was drawn to indicate the right amount of counterpoise for each tower in terms of relative footing-resistance measurements. Hansson had said a good working rule for optimum value is "not over one ohm for each 100 kv. of insulator flashover value on $1\frac{1}{2} \times 40$ wave."

Suspicion that variation in water-table has some bearing on discordant results from grounding was voiced by E. Piepho (Detroit Edison) in further relating experience with sneak-current paths disclosed when endeavoring to protect street-lighting tank switches against lightning. Trees, birds and squirrels can cause more tripouts at points of exposed grounding than existed beforehand, he added.

Cables

Load Ratings of Cable—II. Herman Halperin (Commonwealth Edison). Joints may limit safe temperatures. Sheath cracking may limit daily range. Shielded types can stand higher temperatures than belted three-conductor solid. Cable movement increases little after passing 250 ft. Copper shielding tape over thin insulation reduces thermal drop but little.

Low-, Medium- and High-Pressure Gas-filled Cable. G. B. Shanklin (General Electric). Self-supervising. Compound migration eliminated, gas flow facilitated. Ionization reduced leak location easy. Sheath reinforced for 40-60 kv. up to 40 psi. Insulation thickness 142.5 volts per mil for 138 kv. with 200 psi. in pipe. Impulse strengths comparable to solid and oil-filled cables.

120-Kv. Compression-Type Cable. I. T. Faucett and **R. W. Atkinson** (both General Cable), **L. I. Komives** and **H. W. Collins** (both Detroit Edison). Developmental tests, experimental installation of oval cross-section cable in 200 psi-nitrogen in welded pipe. External pressure on sheath inhibits void formation in oil during load cycling.

120-Kv. High-Pressure Gas-Filled Cable. I. T. Faucett and **R. W. Atkinson** (both General Cable), **L. I. Komives** and **H. W. Collins** (both Detroit Edison). Experimental and commercial installation (7 miles long, 95,000 kva.). No ionization up to double voltage due to high viscosity saturant, high density paper (thin at conductors). In 7-in. pipe, nitrogen at 200 psi. Dielectric strength equivalent to oil filled.

The Dielectric Strength and Life of Impregnated-Paper Insulation—III. J. B. Whitehead (Johns Hopkins University). With heavier oil a marked decrease in dielectric strength with increasing paper density. Failure always begins in oil space. Higher strength and stability obtained with thin oil.

G. B. Shanklin, G.E., while recognizing Halperin's acceptance of shortened cable life with higher cable operating temperatures, took exception to 65 deg. C. as an operating temperature for 66 kv., solid-type cable. R. J. Wiseman, Okonite, and R. W. Atkinson, General Cable, found Halperin's loading temperatures acceptable, but pointed to resulting reduction in cable life.

Shanklin's statement, in the paper on low-, medium- and high-pressure gas-filled cable, that experience with low-pressure cable is satisfactory from operating standpoint drew from Herman Halperin, Commonwealth Edison, the comment that solid-type cable is also satisfactory from an operating standpoint and, further, that it simplifies operations and saves money in Chicago. Wiseman failed to agree with Shanklin that pipe-type cable was not applicable to city streets in view of the Detroit SMD type cable installation where 70 percent was under paved asphalt streets.

Halperin, discussing the Detroit SMD gas-filled cable, expressed the thought that oil-filled should have a higher breakdown than gas-filled cable. W. A. Del Mar, Habirshaw, said power factor data at room temperature is no accurate criterion of stability at such low temperatures. Major E. R. Thomas, formerly of Consolidated Edison, felt that if the Detroit SMD type cable lives up to expectations it should be a hard one to compete with. R. J. Wiseman pointed out that steel-pipe-type cable systems can carry large loads without overheating; with Oilostatic cables earth temperature 17 in. from pipe does not stabilize until six hours after load is applied, due to high thermal capacity. K. S. Wyatt, Kennecott, questioned Detroit Edison's wisdom in selecting a Beaver type cable in preference to a high-pressure compression-type cable or Oilostatic. Factor of safety of 2 for Beaver against 5 or 6 for the others was cited against it by Wyatt; breaks in the pipe with SMD cable would necessitate immediate removal from service, while compression-cable can be operated for 24 hours after such a break.

Transmission and Distribution

Analysis of Short Circuits for Distribution Systems. G. F. Dalziel (University of California). Laboratory studies support conclusion that effects of transformer may be neglected in approximate determination of short-circuit current in low-voltage circuits due to high-voltage transformer failures.

Series Capacitors for Transmission Circuits. E. C. Starr (Oregon State College) and **R. D. Evans** (Westinghouse). Conducive to optimum loading of long lines and to reduced transmission cost. Propose limited voltage type with restoration of capacitors after faulted conductors are isolated, conducive to stability.

Stability Study of A.C. Power-Transmission Systems. J. M. G. Holm. Analysis of 31 practicable systems from 50-500 miles, 69-345 kv. and 50-800 mw. to show influence of generator and bus reactance, line im-

pedances, breaker times, fault characteristics, neutral grounding, intermediate condensers, etc., upon steady-state and transient stabilities for normal and emergency conditions of line operation.

Rather critical comment by J. W. Butler (General Electric) on the Starr-Evans paper was to the effect that it seemed to present no developments not conveyed by prior papers. He cited the installation of a series capacitor in a 33-kv. line in 1928 under similar conditions of shorting out and restoration after faults. A. C. Monteith (Westinghouse) called the proposal a definite contribution toward the present need of transmitting maximum power with superior stability and avertance of third and fourth lines where two can be provided with series capacitors at their middles.

Professor Starr felt the analysis for 115 and 230 kv. was a useful extension of the conception well above the level of prevailing practice. Recent developments permit short-circuiting a series bank of capacitors at well advanced voltages.

Somewhat contrary to the Starr-Evans analysis, the Holm paper finds three intermediate synchronous condensers on a 500-mile line adding 60 percent in stability against only a 45 percent gain for a single station.

Measurements

Theoretical Possibilities of an Internally-Heated Bimetal Type of Thermal Watt-demand Meter. Edward Lynch (General Electric). High torque (2,000 gram-millimeters) and rapid diffusion of heat obtainable by internal heating of bimetal with superior response characteristic.

A New Moving Magnet Instrument for Direct Current. H. T. Faus and **J. R. Macintyre** (both General Electric). Diametrically magnetized cylindrical moving-magnet element, copper damping cylinder, high-coercive control magnets and mumetal shield. Adapted to battery-testing voltmeter without jewels.

A New Jewel for Indicating Instruments. F. H. McCune and **J. H. Goss** (both General Electric). Drop of fused "hard-glass" formed. Impact has no effect up to critical point at which jewel and pivot both deform. Equivalent to sapphire for miniature instruments.

That the proposed moving magnet design for d.c. was not intended to replace the D'Arsonval-movement design, but to fit into the area between the vane- and moving-coil types, was the response of the authors to comment by J. H. Miller (Weston). He had mentioned the small draft of energy from the measured supply (*e.g.*, 0.25 microwatts) by modern D'Arsonval instruments and queried whether the possible advantage in cost warranted the limitation imposed by the much larger (50 milliwatt) energy requirement for operation.

Glass vee jewels (patented as early as 1899) were found by Miller, also, to be superior to sapphire on vibration. They are used almost exclusively in the panel instruments of the R.A.F. and production here is supplying the United Nations. Friction coefficient, he felt, is less important than the ability to maintain surface condition. This factor, the authors said in answer to Prof. D. C. Canfield (Purdue), is the deterrent to use in watt-hour meters, although the British are using them. Meanwhile, sapphire cups are still available to us from Switzerland.

Conference on Lighting for War Production

Charging that lighting has been greatly oversold in terms of lumens and foot-candles, J. O. Kraehenbuhl, University of Illinois, challenged the validity of quantitative statements commonly used to express the results obtained by improvements in industrial lighting. There are few or no factual bases, he asserted, to justify statements that in any instance improved lighting has reduced accidents, decreased spoilage or increased production so many percent. In agreement with these deflating remarks, J. M. Roche, National Safety Council, said that no one knew exactly how much good lighting reduces accidents; one investigator might place responsibility on carelessness, another might report poor lighting as the cause.

The matter was summed up by H. B. Dates, chairman of the I.E.S. committee on light in wartime, who said that the accomplishments of good lighting should be expressed qualitatively, not quantitatively and that there was much more to good lighting than just foot-candles.

Present difficulties in obtaining materials for lighting installations were considered from two angles at the meeting. One was dealt with by E. D. Tillson, Commonwealth Edison, in a talk and a demonstration on the use of substitute materials. Mr. Tillson described and showed fluorescent reflectors of enameled Masonite. The other angle was that of improving, or, rather, restoring, the performance of present installations discussed by A. K. Gaetjens, General Electric. An investigation of 27 installations, he reported, showed reductions of illumination of 17.5 percent caused by dirt, of 2.3 percent caused by outages and of 18.6 percent caused by lamp depreciation, defective auxiliaries, etc. Good maintenance should be able to hold lighting installation efficiency at 80 percent or above continuously.

John Parsons and M. A. Bostwick, Westinghouse; P. M. Sandstrom, Commonwealth & Southern; H. F. Roempke, Indianapolis Power & Light, and E. L. Harder, Westinghouse. At right, C. B. Owen, Aluminum Company of America; H. E. Wulfing, Commonwealth Edison; W. B. Morton, Philadelphia Electric; M. R. Gowing, Ohio Brass; J. M. Livingston, Schweitzer & Conrad; H. K. Smith, Westinghouse, and H. W. Eales, Public Utility Engineering & Service

Editorials

S. B. WILLIAMS, *Editor*

War Taxes Make Orphans Attractive

ONE OF THE EFFECTS frequently predicted of a strict administration of the Holding Company Act was the eventual ownership by municipalities of orphans cut off from any permitted integrated system. Discussions of that nature are now taking place with regard to properties in four major cities—Cleveland, Omaha, Birmingham and San Antonio.

The situation, if it were not so serious, might almost be amusing, because it so completely changes the setting of the customary effort on the part of a municipality to purchase a local utility. Generally there is an anxious buyer and an unwilling seller; now, except perhaps for one case, the city administrations do not appear to be overly enthusiastic over the opportunity, while the companies, though not offering their properties, are not unwilling to listen to offers.

Under such conditions it would appear as though a municipal purchase, if made, would be without opposition on the part of the company, on the assumption, of course, that an acceptable price had been agreed upon by negotiation or arbitration. Generally when opposition is expected those promoting the purchase program offer voters the bait of greatly reduced rates, but the necessity would appear to be lacking in situations such as these.

What would be the result? Those cities that were successful in purchasing local utility property would receive from the federal government what would amount to a remission of war taxes. The consumers might or might not get lower rates, but the government in any event would lose war taxes, and what would in essence be returned to these cities would then be saddled upon the rest of the country.

What does it amount to? Well, last year the Omaha company paid nearly a million and a quarter in federal taxes, Birmingham almost $700,000, and Cleveland 5½ million. This year it will be much more.

Why should the people of these cities, or for that reason of any city that has a municipally owned electric service, be given an exemption from paying federal taxes at this time, when everybody should be assessed his ability to pay? These are not taxes upon a city property, but upon the users of a service furnished by the city, the pro-rata share of which would appear upon the light bills.

The principal argument in one city is that such a purchase would relieve the people of that city of "the federal tax burden." This doesn't mean the consumers necessarily would save, but that the city would get what the federal government had been getting and, with the additional revenue, could lower local tax rates. Back of this, of course, is the thought that lower tax rates would entice industries from other locations. So by getting a remission of war taxes, which would fall on others, they would be enabled to lure away the industries of other cities. As electric utility taxes continue to mount, more cities will be tempted to purchase local utility property—at the expense of the government.

Why should these cities be allowed to collect for their own benefit the taxes that belong to the federal government? Why should the people receiving tax-free electric service not be required to pay their share of the cost of war and government the same as anybody else?

Man-power Fund

INDUSTRY is being asked to subscribe to a fund of five million dollars to save the lives of and prevent injuries to war workers. The program has the support of the President and others who have high administrative posts in the war effort.

But what a small amount to do so big a job. Just imagine what the sum would be if government decided to do the job, and the same people would pay for it—industry. The situation is serious enough to bring government action unless the job can be done otherwise.

This War Production Fund to Conserve Man-Power will be used by the National Safety Council in doing for industry generally more or less what it has been doing for its members for a great many years. This is the subscriber's assurance that the fund will be carefully administered.

Here is an opportunity to serve the country, to save money and to preserve one of management's prerogatives.

The Puerto Rican Seizures

JUST WHAT does the seizure by the federal government of the two Puerto Rican companies portend? If we take the reason given, namely, the need for integration with government-owned water power in order to reduce the need for oil, then is this a forerunner of what may be expected in other parts of the United States during a tight transportation situation?

Integration of operating properties of differing ownerships is already an actuality in large areas of the country. It has been invoked to help out where water was short and it can just as easily help where fuel is the problem. There should be no ownership problem in this.

But even if there were a problem, and some recalcitrant utility refused to enter the integrated system, it would be simple for the government to protect its rights

just as it did at one of the eastern shipyards or one of the western airplane plants in labor disputes that were hindering war production. If there was no necessity then for seizing a property beyond the correction period, what is the justification in the case of a utility?

Could it be the precedent for using war powers to take title to some property desired by one of the federal power projects? Or, with Grand River and High Point now back in federal ownership, is the Puerto Rico incident to furnish the pretext for taking over Santee-Cooper?

Of course, it could be the President's method of telling both the utility industry and the WPB Power Branch to get busy on regional integration before winter makes its demand on fuel transportation, or else. The Secretary of the Interior engineered the Puerto Rico deal.

In any event, the reasons given are so thin that it must be evident that the real reasons for taking title lie in some other direction.

New Opportunity For Business Leadership

ELECTRICAL manufacturers can be justifiably proud of the confidence recently shown in their trade association, NEMA, by WPB. Chairman Donald Nelson of WPB has formally asked NEMA to recommend ways in which critical materials can be conserved in the manufacture of electrical equipment. This request of NEMA is the first of its kind made by WPB of a trade association, and upon the results may depend similar direct requests in other manufacturing fields. Thus NEMA again leads the way as it did in NRA days.

This request at first concerned only the up-rating of electrical equipment, but was shortly followed by a request that NEMA not limit itself to this one subject but explore the possibilities for conservation broadly.

One reason, perhaps, why NEMA was chosen as the trial horse in this phase of conservation through industry cooperation was that, foreseeing such industry action, it had several months ago set up a policy and a machinery for quickly getting results. Except under special dispensation neither the association nor any section could make any such recommendations except at the written request of WPB. In addition to inviting the other members of the industry to participate in the discussions it is the policy of NEMA that any such reports or recommendations shall be sent to all known members of the industry, stating that any member of the industry may send his differing suggestions direct to WPB.

In any action so taken it is the policy of NEMA that no attempt shall be made to determine policies for the industry, nor shall the manufacturers make any agreement among themselves as to individual action; the implementation of these recommendations will have to be undertaken by WPB on its own authority. In this way the pattern has been set up whereby manufacturers can cooperate in this vital phase of the war effort without fear of running afoul of the Department of Justice.

If this new approach to industry cooperation works out well, and there is every reason to believe it will, it will inaugurate a new opportunity for business leadership. We are proud that an electrical trade association has been chosen to lead the way.

Feedwater Treatment to Avoid Outages

DUE to the present demands for continuous service of power plant equipment, avoidance of outages of major units require even more consideration than in normal times. In boilers, for instance, there are two major causes of outages, slag or ash on the outside of tubes and scale or corrosion on the tube's inside. The outside conditions may be due to some factor in the design, such as too hot gases entering the tube banks or to the nature of the fuel that must be used. Changes to eliminate these troubles, however, may be economically impractical at this time.

While conditions inside the tubes may in some cases be due to faulty circulation, as a rule improper feedwater treatment is the cause of the difficulty. When low steam pressures were in use, feedwater treatment was a matter of less importance than now. The high steam pressures with corresponding higher boiling temperatures, together with the high rates of heat transfer now common practice, has made the character of the boiler water a factor of major importance in continuous plant operation.

Unfortunately, the best methods of feedwater treatment are not always employed. This is no reflection upon the ability or will of the operating staff. Instead the difficulty lies largely in the fact that the nature of the reactions at boiling temperatures of chemical compounds dissolved in feedwater are not completely known, while the soluble solids in the feedwater also change in quantity from time to time, necessitating changes in treatment processes. As a result of these factors the best-known treatments are those which experts in feedwater problems have developed, partly from theoretical considerations, but largely from practical experiences with actual boilers operating under differing conditions and with all kinds of water problems.

Unfortunately all boiler operators do not possess the special chemical training to enable them to develop their own treatments, and this may lead to boiler troubles and outages. On the other hand, those who have specialized on the study of feedwater treatment can be relied upon to specify the best-known methods to use with different waters and different conditions of operation.

Chances of boiler outages due to feedwater difficulties should not be taken. If there is any indication of trouble with feedwater, the best advice possible should be secured at once and the recommended practices should be put into effect. This will prove cheapest in the end. At the same time all information on boiler water treatment should be made available to other engineers who are responsible for steam generation.

Washington Comment

By GEORGE E. DOYING, Jr., Washington Correspondent

Seizure Not Necessary for War Integration

IS IT NECESSARY to have unified ownership of utility facilities to obtain the maximum integration and efficiency of operation needed to fill wartime emergency requirements for power or to meet threatened shortages?

The question comes up as a result of the government's seizure of the two privately owned utilities in Puerto Rico by condemnation proceedings in order to integrate them with federally owned hydro facilities and conserve use of fuel oil. There, the answer to the question posed is a flat, yes—the first affirmative in a sea of no's which have gone before.

No Isolated Instance

This is no isolated instance, however. Rather, it is a small scale consummation of a policy subscribed to by many of the public power advocates of the Administration. Secretary Ickes recently advanced it in urging quick enactment of the bill setting up a Northwest regional power agency so that ownership of utility properties in that area could be unified. He termed this a necessary preliminary to obtain operating integration for the war period.

The Puerto Rico properties were taken over by the simple expedient of filing a "statement of taking" by the Federal Works Agency under Section 202A, Title 2, of the Lanham Act of October 14, 1940. Immediate possession and title is obtained by posting cash with the federal court equal to the government's appraised value of the property pending determination in hearings of a sale price.

The action was taken on the recommendation of Rexford Guy Tugwell, Governor of the Island, to Ickes, who passed along to FWA the idea of buying the properties through use of the Lanham Act so as to bring about unified federal ownership, which would give unified management, which would permit greater use of water power, and thus save oil. The President approved the scheme, and it was done.

Prior to the Puerto Rico incident, there have been several other times that the matter of integrating operations has been resolved against the need for disturbing ownership.

For instance, in reporting the Interior Department appropriation bill to the floor in May the Senate appropriations committee proposed, as a wartime solution to the Central Valley power development program that, ". . . as has been patriotically accomplished elsewhere in the United States by public and private interests, the Secretary of the Interior and the Pacific Gas & Electric Co. immediately enter into a contract, for the duration of the war and a reasonable time thereafter, for the complete pooling of all public and private power facilities which will result in delivering the greatest amount of power to war industries in the least possible time and with the greatest possible economy in the use of critical and strategic materials."

Ownership No Barrier

The Senate version of this section of the bill subsequently was approved by the House, after several congressmen, in floor debate, expressed a desire to see the public and private facilities pooled without regard to ownership. Has this actually been done any place?

It has, and in a big way last year to relieve the drought-stricken southeast. Utilities serving parts of seventeen states, it will be recalled, relayed energy through transmission lines to supply power which kept the aluminum and other war plants in operation. For several weeks, during the year-end peak load period, more than 75,000,000 kw.-hr. a week was delivered into the shortage area—and there were both public and private operations on the giving and on the receiving end.

Early this year in the Southwest the utilities organized a wartime power pool to serve the government aluminum plant in Arkansas. In the end the WPB power branch directed a broader pooling of facilities in the area which combined public and private generation to get the peaking potentialities of the former.

Another sample of a "no" answer to the original question was the recent pooling between southern California Edison and the city of Los Angeles, when the city accepted postponement of scheduled expansion so that it could be placed elsewhere. Not always has the pooling awaited government initiative! In the Northwest private companies and the Bonneville Administration have worked out an interchange agreement.

WPB Policy

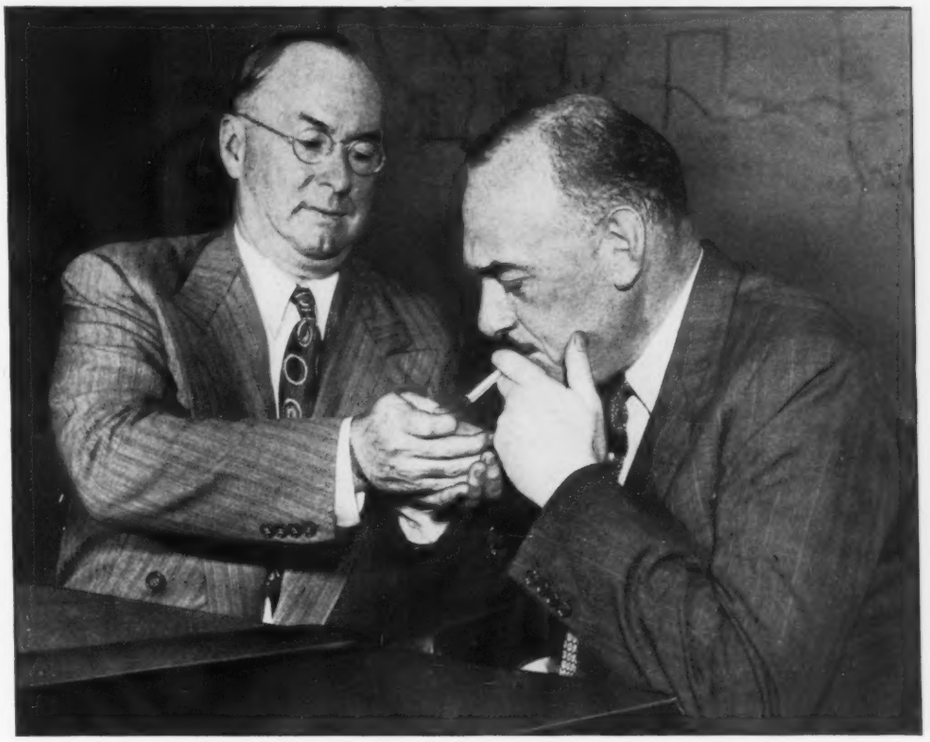
The obvious conclusion is that the power branch at WPB has not found that diversified ownership is any barrier to integrated operations. The branch was not a party to the Puerto Rico incident and its own activities have all disregarded ownership.

This policy also is reflected in the machinery which the branch has set up for administering whatever curtailment programs prove necessary—Order L-94. This order deals entirely with operations and contemplates unified managing direction without regard to ownership where conservation programs are put into effect. It directs utilities to so operate their connected systems as to produce the maximum efficiency from existing equipment and conserve the maximum of fuel resources—the issue, incidentally, involved in Puerto Rico.

Utilities also, under this order, are directed to determine what additional connections can be made, both with other utilities and with industrial power stations, which would improve their ability to serve the war effort. Planned in advance, the idea is that these additional integrating steps are thus ready for prompt application where needed.

So long as this cooperative integration continues to work as it has in the instances cited, the preponderance of Washington opinion appears to favor it over permanent acquisition simply to meet an emergency need.

The Story That Must Be Told



Two men who know the story best: Donald Nelson, Chief of the U. S. War Production Board, and (right) Oliver Lyttelton, Great Britain's Minister of Production.

BETWEEN THE LINES of today's war news is written a story that is even more vital than the news itself. For through that story we begin to discern the pattern of victory, not yet complete in all its details but increasingly clear in its essentials.

It is the amazing story of how American industry has responded to the call for the weapons of total war, of how its technicians, workers, and managers are driving through an unprecedented task of fantastic size and complexity.

France fell in June 1940. During that month this country produced about $150,000,000 in war goods. By June 1941 the Nazis had overrun the Balkans; and in that month our war production was $800,000,000. The fateful month of December 1941 gave us an output of $1,800,000,000—an increase better than tenfold in eighteen months. And in May 1942 our total expenditures for war equipment and supplies mounted to the staggering total of $3,500,000,000.

This is an increase of twentyfold within two years, of itself a stupendous industrial achievement. But what is even more important, that achievement already is making itself felt the world over—in the Orient, in Australia, in Libya, in Europe, in the Coral Sea, at Midway Island, at the Aleutians, and wherever else we find a battlefront manned by free men.

To accomplish it, many industries have been pouring out war materials at a rate that only six months ago did not seem even remotely possible. Starting from scratch, our factories have turned from their peacetime jobs, first to meet and then to surpass the most hopeful estimates of what might be expected of them.

To do this they have drawn heavily upon all of their resources. Their skilled and unskilled

man-power has thrown into the task a war-born will to work; their research staffs have bent to it all of their scientific resources; their engineers have applied to it their utmost ingenuity; their executives have devoted to it the full measure of that managerial skill which has won for American industry the respect of the modern world.

For the first time in history we have pushed the accelerator of the world's greatest engine of mass production down to the floorboard. Always in times of peace, factory men have had to gear production to what the markets would take. But now the market they are called upon to serve is hungry for the last ounce of potential output. For war confronts industry with a demand limited only by its capacity to produce.

During these feverish months, while a desperate world has watched breathlessly to see how American industry would perform as the arsenal of democracy, we of McGraw-Hill have followed with mounting pride — at times almost with wonder — a new miracle of industrial achievement.

Some day the full story of this American industrial effort will fill a brilliant chapter in the epic history of our times. Meanwhile it would be premature to celebrate the completion of this task. For victory has not yet been won; that still lies at the far end of a road that we may find to be long and arduous.

But even now we can be certain of one essential of that victory. American industry is doing its job; it is delivering all that the people have asked of it — and more.

As I have watched with my associates the unfolding of this picture, I have wished that it were possible to broadcast it, in full color and wealth of detail, to the people of America, so that they could understand at least, in part, the job their industry is doing for them. It would help, it seemed to me, if the men of industry themselves, each so intent on his own task, knew what their fellow-workers in other fields have been doing.

However, the managers of industry have been far too busy ***doing*** to talk. They are going to be just as busy for some time to come. Naturally, many details are yet to be spread upon the record and, indeed, the full story cannot be told. But that part of the story that can be told is well worth the telling and the hearing, if only for its revelation of the spirit of an awakened America, throwing its all into the fight against the tyranny that has brought so many of the world's little people under its heel.

The 1941 war production of the United Nations, exclusive of the United States, equalled the total 1941 war output of Germany with all of its captive plants and enslaved labor. Since Germany's 1941 operations were at maximum capacity no further increase is possible. British output has been expanding to the point where its 1942 production is considerably ahead of Germany's.

In May 1942 American war production passed the British output 50 days ahead of schedule. In 1943 it will be 3 times that of the British.

This has been brought about under the leadership of Donald Nelson and the War Production Board, the Army, the Navy, the Maritime Commission, with the cooperation of management and labor. It has been furthered by the cooperation of Oliver Lyttelton, British Minister of Production, and other British production authorities.

But the story goes far beyond that. It gives us a glimpse of the America as it will emerge from this war, its industries again setting world standards of production, which will become the spearhead of our post-war economy.

This is a story that cannot be adequately told in generalities. It must be told in some detail. For instance, the great accomplishments of the machine tool industry, the great forward strides made by the aviation industry, the tremendous achievements of the chemical industry, the amazing conversion of many industries will warm the hearts of Americans.

These aspects of the subject deserve the fullest treatment and will be told month by month in these pages until the story has been completely unfolded. We will try to give a concise overall picture of the war job that industry has done and still is doing. You will find it a thoroughly American story of high American achievement in which every American can take pride and from which every American can take hope for the future of his country.

The story is far too significant to be withheld any longer.

James H. McGraw Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

NEWS OF THE WEEK

NEMA Studies Up-Rating of Electrical Equipment

Acting on WPB request, association survey expected to result in specific recommendations on changes in specifications to conserve critical materials

The National Electrical Manufacturers Association has been formally asked by the War Production Board to make specific recommendations for the up-rating of electrical equipment as a step toward conserving materials by "designing electrical layouts more closely to conform with the actual physical capabilities of the various items of equipment."

NEMA's study is covering the entire range of electrical equipment. Recommendations sought by WPB are to go beyond the strict field of up-rating into the realm of changes in specifications to conserve critical materials in any possible manner.

Power Branch Made Suggestion

The request comes directly from WPB chairman Donald Nelson, who acted upon a suggestion from the WPB power branch that considerable savings in critical materials could be effected by obtaining a higher use factor on electrical equipment. Preliminary estimates of the power branch indicate that increases in ratings up to 25 percent are feasible on most items of equipment.

NEMA is asked to have its recommendations in WPB's hands by mid-July, so that acceptable changes both in the nameplate nomenclature on the equipment and in design can be put into effect at the earliest possible time. Just how the program will be put into operation has not been fully determined, but if it is deemed advisable, for legal or other reasons, to do so WPB can order alterations into effect. Recent recommendations from NEMA's transformer section (ELECTRICAL WORLD, June 13, page 59) were put into effect simply by the power branch's acceptance of the proposals as its policy in issuing priorities for this type of equipment.

In this far broader study of the field, however, Nelson states in his letter of request to NEMA that it is assumed "that appropriate recognition would be made of any such change in the nameplate nomenclature on the equipment, and perhaps in some change in design."

The request of NEMA is the first of its kind made by WPB of a trade association. It comes as another phase in the never-ending campaign to conserve critical materials in every possible way. Upon the results may depend similar direct action in other manufacturing fields.

Mr. Nelson's letter points out that if any such general up-rating as that which is suggested by the power branch could be effected "this would result in a substantial savings in the critical materials which enter into the manufacture of products."

SAFETY AWARD—R. O. Smith, left front, head of Boston Edison's meter maintenance division, receives a merit plaque from Alfred L. Dowden, public utility engineer Liberty Mutual Insurance Co., Boston, commemorating over 500,000 man-hours of work in field and repair shop activities without a lost-time accident since December, 1939. Presentation was in the Edison company's meter shop, where special safeguards for high-voltage insulation tests are utilized in addition to supervised working methods designed to speed up operations without hazards to employees. Precautions against accidents on customers' premises form a major part of the division's routine

NEWS BRIEFS

REDDY KILOWATT, the imp who humanizes utility service, figured it was about time to see what was going on in Europe. He has been signed up for the first time on the continent by the Compagnies Reunies Gaz & Electricite, Lisbon, Portugal. Up to now his only excursions outside of territorial U. S. have been in Canada, Argentina, Brazil, Cuba, Hawaii, Alaska and the Philippines.

TWO YEARS OF UNREMITTING EFFORT to improve its community's street lighting has won the "Safety With Light" prize of $250 and a plaque for the Iowa City Junior Chamber of Commerce. A big reduction in night traffic accidents was the result of their relighting activities. Other winners were Cleveland, O.; Monett, Mo.; Long Beach, Calif.; and East St. Louis, Ill.

H. W. DERRY, manager of the new industries department of Pacific Power & Light at Pasco, has put out a trial planting of new farm crops to be grown there for essential oil, used in varnish and paints. Castor beans, Russian mammoth sunflowers, safflower and coriander seeds have been planted, the seed supplied by the National Farm Chemurgic Council.

FRED WHITELY, district manager of Wisconsin Power & Light Co., Fond du Lac, was the recipient of a diamond pin presented by A. P. Gale, vice-president, recently, in recognition of 25 years of service with the company.

LINES OF THE Danbury (Conn.) & Bethel Gas & Electric Light Co. gave way July 2 and fell across a 22,000-volt railroad line at the local depot, depriving the business section of Danbury of power for an hour.

BIRMINGHAM has recently repealed an ordinance requiring use of weatherproof wire for 5,000 volts and less for overhead conductors.

THE WRECKING OF A 5,000-kw. turbine electric generator in the Decatur, Ind., municipal light plant recently left the city without electric power. Portions of the wrecked generator flew through the roof of the plant. No definite cause was ascribed to account for the accident, but plant officials surmised that the sudden shutting down of some industry released the power drag on the generator and a regulating device failed to function.

EXCEEDING BY TWO MONTHS its previous longest run of six months, the No. 1 unit of Port Washington power plant of Wisconsin Electric Power Co., was stopped May 8 on schedule for general maintenance and inspection. It had been in continuous operation for eight months and a day. Its previous long runs were one each of four, five and six months. The unit was returned to service May 31.

THERE HAS BEEN SOME DELAY in production of the 80,000-kw. turbo-generator for the new No. 2 unit at Port Washington plant of Wisconsin Electric Power Co., because urgent work for the navy requires the manufacturers' facilities.

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American Gas Would Shift Capital Accounts

A declaration has been filed with the SEC by American Gas & Electric Co. under which it seeks approval of a plan to convert into capital contributions $3,500,000 lent by it to three subsidiaries to assist them in financing programs. The sum includes $2,500,000 advanced the Atlantic City Electric Co., $500,000 to Indiana General Service Co. and $500,000 to Indiana & Michigan Electric Co.

At the same time the company sought the commission's approval of a plan to make additional cash contributions of $500,000 to Indiana General Service and $1,500,000 to Indiana & Michigan. Such capital contributions would be credited, as in the case of the former amounts, by each subsidiary company to its capital surplus account and then to reserve.

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New F Lamp Circuit Saves Scarce Metals

Savings of large tonnage of critical metals are forecast in the announcement this week by General Electric Co. of a new sequence starting series circuit for fluorescent lighting.

The new circuit is designed for use only with 100-watt fluorescent lamps and on 254-, 265- and 277-volt circuits. Instead of two ballasts the new circuit permits the use of but one ballast for four 100-watt lamps. The two lamps on each phase of the new circuit start in sequence and operate in series.

In one large airplane plant, where fixtures using the new hook-up are under consideration and in which more than 35,000 100-watt fluorescent lamps will be installed, it is estimated that 23,275 lb. of copper, 80,960 lb. of iron and steel and 3,250 lb. of aluminum will be saved. The over-all saving in the weight of the ballast equipment totals about 132,000 lb. and a total of 303 kw. of current would be released for other war uses.

N. E. Power Wins Flood Damage Suit

Damages to the roadbed and track of the Hoosac Tunnel & Wilmington R.R. resulting from the record-breaking hurricane and flood of September 21, 1938, cannot be levied upon the New England Power Co., the Massachusetts Supreme Court decided recently upon an appeal case from a lower court. The railroad sued the company on the ground that its property was injured by a powerful flow of water in the Deerfield River at the Monroe Bridge dam above the utility's No. 5 hydroelectric station in northwestern Massachusetts, contending that the opening of two sluice gates, each about 8 ft. square, increased the rush of waters upon the railroad embankment which was located on the side of mountainous hills forming the sides of the valley. The railroad was 50 to 75 ft. above the river bed and was so badly damaged that traffic was not resumed until November 7.

The court pointed out that the sluice gates were opened to protect every riparian owner; that the flood was unprecedented in violence and extent, and that no evidence appeared that the power company's operating staff failed to carry out the best known practice. Because the gates were opened, the flashboards could be removed, and if the gates had been closed the water level behind the dam would have been increased, with greater flooding of upstream lands and heightened peril to the dam structure. The rainfall preceding the hurricane was extraordinary in volume, and the hurricane and flood were a *vis major* or an act of God. No evidence was presented of negligence on the part of the utility.

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Frankfort Utility Drops K-T Option

The Frankfort Utility Corp., a syndicate formed to purchase the electric properties at Frankfort, Ky., of the former Kentucky-Tennessee Light & Power Co., ordered dissolved in the break-up of Associated Gas & Electric's holding company system, failed to renew its purchasing option recently. State Senator Louis Cox, a member of the syndicate, said the way was now clear for the city to negotiate for municipal ownership.

The corporation petitioned to buy the plants last April, but was stymied by the Public Service Commission's revival of a show-cause order against K-T, which had been requested to justify its rates in Frankfort.

It is known that the city is contem-

plating action of the purchase of the properties, announced purchase price for which is $1,350,000, but Cox intimated that if the city showed much hesitation the corporation might petition again to make the purchase.

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Boise Financing Approved by SEC

Conditional approval has been granted by the SEC to the amended joint application of General Water, Gas & Electric Co. and its subsidiaries, Boise Water Co., Kellogg Power & Water Co. and Natatorium Co., under which Boise would acquire all the outstanding securities of Kellogg, consisting of $100,000 6 percent demand note and 65,000 shares of $1 par common stock in exchange for 1,650 shares of Boise $100 par common stock.

The commission also approved the issuance and private sale of $950,000 principal amount of bonds at 101½ by Boise and the redemption of $1,000,000 face amount of bonded debt by Boise from General Water in consideration of $750,000 cash and $250,000 face value of Boise common stock.

Among the conditions set forth by the SEC are that $250,000 of Boise common be accepted by General Water in lieu of a 5 percent promissory note in settlement of a $250,000 debt, and that the net property of Boise, as shown in its books as of December 31, 1941, be decreased by $386,369 as proposed by Boise.

OPA Revises Schedule on Industrial Machinery

Price regulation No. 136 goes into effect July 22, with prices pegged at last October's levels with the exception of sub-assemblies and services, which take March basic price level

Somewhat changed and limited in scope, OPA's price regulation No. 136 (ELECTRICAL WORLD, May 9, 1942, page 5), covering industrial machinery and parts and machinery services, now is scheduled to go into effect July 22. The maximum price for virtually all electrical equipment remains October 1, 1941, as originally planned, the only notable exception being sub-assemblies produced by some one other than the manufacturer of the complete item, in which event the maximum price is that of March 31, 1942.

Machinery services, which covers "any operation in the processing, machining, welding, treating, finishing, testing, inspecting, adjusting, maintaining, repairing or rebuilding a machine or part owned by another," also are pegged to March 31. Two basing dates are provided for installation labor where machinery is sold on an installed basis —April 27, except where the wage stabilization agreement between the AFL Building Trades and certain U. S. agencies is operative, in which case the date is July 1.

Among items of electrical equipment pegged to the October 1 ceiling are all types of prime movers, boilers, stokers, capacitors, circuit breakers, motor-generator sets, control equipment, industrial heating units and devices, power conversion and rectifying equipment, wire, cable and cable accessories not covered by Price Schedule 82 (covering copper wire and cable and pegging these to October 1 date), industrial fuses, instruments for measuring electrical quantities, knife and inclosed switches, outdoor and indoor substations, panel and distribution boards (except asbestos and cement), special electrical metals and alloys used for electrical resistance, switchgear and accessories, synchronous condensers, transformers, turbine generator sets, wiring devices.

Most of the changes between this order and the original one are intended to clarify terms used and to remove obstacles to expansion of subcontracting, the latter by providing a higher ceiling price for sub-assemblies. Outstanding among administrative changes is the fact that articles which are not listed specifically in the order are not covered by its terms. Originally, only specifically designated articles were exempt.

REFRESHER COURSE FOR FOREMEN—Experienced labor being scarce, Wisconsin Electric Power Co. recently started a refresher course for foremen of the company to give them a short, practical course on instructing new workers. The course consists of five two-hour sessions on selecting and training potential material and actual practice in instructing the men; a typical class is shown above

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WPB's Civilian Supply Making Power Survey

WPB's division of Civilian Supply has set up a fuel and power section in its services programs branch, with Dr. Hubert F. Havlik, director of the Twentieth Century Fund's electric power survey and a public utilities professor at Columbia University, as chief.

At this time, however, Dr. Havlik is temporarily detached from the section, making an over-all nationwide energy supply and demand survey—coal, gas oil and power—to guide Civilian Supply's future recommendations to WPB in this field. Acting Chief of the section during Dr. Havlik's absence is M. E. Shea, from 1933 to 1938 a district engineer for Stone & Webster Service Corp. and later an engineer-analyst with the Securities and Exchange Commission.

The power unit, one of three subdivisions of this section—the others are oil and coal—is headed by Arthur N.

Dunstan, who from 1934 until recently was a rate engineer with the Federal Power Commission. On Mr. Dunstan's staff are Walter A. Beidatsch, formerly with the Twentieth Century Fund and SEC, as an assistant, and E. N. Strait, formerly with the Wisconsin State Commission and later manager of the rate and research division of Public Utilities Engineering & Service Corp., as consultant.

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Middle West Stay Denied by SEC

The Securities and Exchange Commission denied last week a petition of the Middle West Corp. and its subsidiaries, Central & Southwest Utilities Co. and American Public Service Co., for a rehearing of the commission's order of June 4 directing that either of the two subsidiary holding companies be dissolved and that securities of both be reduced to a single class of common stock (ELECTRICAL WORLD, June 13, page 63).

The three companies applied for the rehearing on the basis that the June 4 order of the commission was "so vague and indefinite as to be unenforceable." They argued that the SEC should have listed a detailed plan of reorganization allocating new securities between the various existing classes of security holders. In rejecting this contention, the commission cited similar arguments in the cases of the Northern New England Co., the New England Public Service Co. and the Commonwealth & Southern Corp.

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Guadaloupe-Blanco Bond Issue Denied

A proposed bond issue of $42,000,000 whereby the Guadaloupe-Blanco River Authority sought to purchase the properties of the San Antonio Public Service Co., a subsidiary of American Light & Traction, has been disapproved by the Attorney-General of Texas as being unconstitutional. The utility had been ordered sold by the Securities and Exchange Commission and, with the Attorney-General's ruling, the way is left open for further negotiations by the city of San Antonio for the acquisition of the power company.

In his opinion the Attorney-General held that approval of the bond issue would open the way for the authority to become a stockholder of the utility and acquire property outside of the district to which the authority is limited—both of which, in his opinion, would be unconstitutional.

FPC Revises Rules on Power Contracts, Rates

Power contracts filed with governmental agencies of more than 1,000 kw. demand must be posted; rate increases must also be filed 60 days prior to effective date

Federal Power Commission has issued revised rules calling for filing all utility power contracts with governmental agencies of more than 1,000 kw. demand or 2,000,000 kw-hr. annual delivery and for filing considerable additional data with changes in rates or for new rates.

For rate increases the new rule requires posting with the commission at least 60 days prior to the effective date data giving the actual or estimated original cost and depreciation both for those facilities used solely in rendering service under the rate and for that portion of joint facilities as are allocable to the rate. "If the original cost figures are not available and a reasonable estimate thereof cannot be prepared at the time, book amounts for the required property classifications may be submitted," the rule reads. This requirement has been in effect for gas pipe line rates since 1938.

Basis for Increases Sought

Commission officials readily agreed there is no over-all formula for computing the required allocations. They pointed out that the rates involved, however, are only those under the jurisdiction of the commission, interstate wholesale charges, and that in most cases only a transmission line and its appurtenances will be involved. Where energy sold interstate comes from a system, it will not be necessary to allocate the portion of the generating property used to serve the load, it is stated, although this would be required where the load is served by a single generating station.

"When a company increases its rates, there is usually some basis for that increase," said a commission spokesman. "What we want to know is what that basis is."

In addition to the property figures, substantiation of rate increases will require an estimate of annual fixed charges by major items (taxes, depreciation, return, etc.), and a statement or estimate by main accounting classifications of operating expenses divided as to those allocable specifically to the particular rate and those which are part of joint expenses. Any of the required data which may already be on file with FPC may be cited by reference as a means of keeping additional work to a minimum.

The rule requiring filing of all contracts covering government loads was adopted because it is felt that these arrangements should be on file for reference purposes, it is stated at FPC. There is no intention to initiate a wholesale rate investigation.

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New Boulder Dam Generator Completed

Completion of the installation of a new 82,500-kw. generator at Boulder Dam has been announced by John C. Page, commissioner of the Bureau of Reclamation, in a report to Harold L. Ickes, Secretary of the Interior. Addition of the new unit, Mr. Page disclosed, brought total new installations of generating equipment on Reclamation projects in the west since June 30, 1941, to 494,000 kw.—a 50 percent increase.

The 50 percent gain jumped the total generating capacity of the 28 hydro plants on seventeen Reclamation projects in eleven Western states from 953,926 kw. on June 30, 1941, to 1,447,926 kw. as of July 1, 1942. For the preceding fiscal year Mr. Page itemized the following installations: Grand Coulee Dam, 324,000 kw.; Boulder dam, 165,000 kw., and Minikoda project (Idaho), 5,000 kw. Scheduled installations during the next six months include: Grand Coulee, 150,000 kw.; Parker dam, 90,000 kw., and Boulder Dam 82,500—a total of 322,500 kw.

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REA Prepayments in May Reach All-time High

Announcement has been made by the U. S. Department of Agriculture that 87 REA-financed rural electric systems in 24 states paid $502,340 on their loans in advance of due dates during the month of May, setting an all-time high record for advance payments.

REA on April 1 had advanced $344,620,369 on loans to borrowers in 45 states, Alaska and the Virgin Islands. The 788 systems energized on that date were operating 359,549 miles of line, serving 946,371 farm and other rural consumers.

Discuss Conversion of Southeast Industry to War

Atlanta meeting brings utility men and WPB officials together for forum; Collier pleads for decentralization of war effort to bring more work to small industrial concerns

How to make greater use of Southeastern industrial facilities for all-out war production was the subject of an all-day meeting between utility executives and WPB officials in Atlanta, July 2. The meeting was sponsored by the Southeastern Electric Exchange in cooperation with the WPB regional staff and was attended by about 40 men from both groups.

Open Forum on Conversion

C. A. Collier, Georgia Power vice-president, presided over the morning session of the S.E.E.-WPB meeting, while Hugh G. Isley, sales manager of the Carolina Power & Light Co., took over the afternoon session. The latter consisted of an open forum with detailed discussion of industry conversion to the war effort, inventory of their facilities, methods of learning procurement requirements, government financing assistance on filling war contracts, etc.

O. M. Jackson, deputy regional director of WPB, explained the reorganization of the WPB staff in the Southeastern region in an effort to help convert non-essential industries to war production. "With the usual dependable help of the engineering staffs of the electric utilities," he said, "our field engineers can discover what the South can do in the war effort and can help convertible industries obtain contract after contract. Getting products out of the southeast for successful prosecution of the war effort is the single purpose of the WPB and should come first with all Southern industries."

Asks Decentralized War Industry

As vice-chairman of the Georgia Industrial Location Advisory Committee, Mr. Collier spoke on the necessity for Southern industries to turn to war production. He cited figures showing that the southeastern states had made a poor showing in the winning of war contracts during the first months of the all-out war effort, and accounted for this situation by pointing out that, being small, "Southern industries have lacked the management necessary to get war work." War industry in the United States must be decentralized, he said, and it is up to the utility companies, together with WPB, to help small industrial concerns to obtain their fair share of war business. In conclusion, Mr. Collier asked utility men to make their "man-power and facilities available to the WPB in making an inventory of industrial facilities and in helping Southern industries obtain war contracts.

Julian L. Mason, regional chief of WPB field operations and production, expressed appreciation for the assistance of the utility engineers in carrying forward the WPB program for Southern war production.

J. H. Barnett, regional woodworking section chief for WPB, pointed out the opportunities for Southern lumber and woodworking plants to make a contribution to the war effort by supplying lumber for crating war materials for export and for producing furniture and aviation materials needed in fighting the war.

SURVEY GEORGIA INDUSTRY—WPB officials and Georgia Power executives confer on the cataloging of Georgia industrial facilities for war work. Seated, left to right: W. H. Barnwell, industrial manager of the utility; Julian L. Mason, southeastern regional production chief for WPB, and C. A. Collier, Georgia Power vice-president and vice-chairman of the Georgia Industrial Location Advisory Committee. In the rear are three industrial specialists of WPB

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B. & S. Surplus Power Still Goes to TVA

Companies in the Electric Bond & Share system again have gone to the aid of power systems in Tennessee, as they did last year, by sending large amounts of surplus power to TVA for the aluminum industry and other important war loads, according to C. E. Groesbeck, chairman, and S. W. Murphy, president, in the annual report to stockholders for the period ended March 31, 1942. For many weeks in the first quarter this contribution, it was said, was in excess of 9,000,000 kw.-hr. weekly.

Gross revenues of system companies showed substantial improvement, but net showed a sizable decline. The report reveals that Bond & Share failed to cover its first quarter dividend requirements of $1,963,833 by $573,395. For the twelve-month period net income amounted to $8,251,847, after expenses and federal income taxes, equal after preferred dividend requirements to 1 cent a share (par $5) on 5,250,358 shares of common stock. This compares with net income of $10,453,275, equal to 38 cents a common share, for the period ended March 31, 1941.

The report warns stockholders to prepare for important basic changes in the Electric Bond & Share system due to Securities and Exchange Commission orders under the Holding Company Act.

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Uphold FPC Order

Upholding a previous FPC order, the U. S. Circuit Court of Appeals at Cincinnati directed the Louisville Gas & Electric Co. to write off $601,937 against its earned surplus account. The company claimed the sum as the cost incurred by an affiliate in the construction of a hydro-electric plant.

Lewis Heads Power Pooling Committee

Announcement has been made of the appointment of Fred B. Lewis, vice-president of the Southern California Edison Co., to head the newly organized Southern California Electric Power Interchange Committee, organized for the pooling of southern California electric power resources for war production and for the protection of normal consumer supply.

Other members of the committee and the agency they represent are Roy Martindale, Los Angeles Bureau of Power and Light; N. B. Hinson, Southern California Edison Co.; J. H. McCambridge, Burbank Public Service; B. F. DeLanty, Pasadena Water and Power Department; P. Diederich, Glendale Public Service; E. H. Halpenny, California Electric Power Co.; E. D. Sherwin, San Diego Gas & Electric Co.; M. J. Dodd, Imperial Irrigation District; E. A. Moritz, Bureau of Reclamation; E. F. McNaughton, California Railroad Commission, and M. W. Edwards, California Railroad Commission, committee secretary.

Mr. Lewis has been "loaned" to the Electric Power Interchange Committee for the duration, according to Harry J. Bauer, president of Southern California Edison.

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Consolidated Files Integration Plan

Consolidated Electric & Gas Co., as part of a program for simplifying its corporate structure, has filed a plan with the SEC calling for the ultimate divestment by the company of the securities of its subsidiaries, in compliance with the "death sentence" clause of the Holding Company Act.

Consolidated proposes to redeem and retire $7,490,000 first lien collateral trust sinking fund bonds for which it is the obligor upon Central Gas & Electric Co. Consolidated proposes to effect the redemption of these bonds with part of the proceeds to be derived from the sale of new first mortgage sinking fund bonds to be issued by Central Indiana Gas, Citizen's Gas, Florida Public Utilities, Hoosier Gas, Houghton County Electric Light, Lynchburg Gas and Maine Public Service Co., such proceeds to be received by Consolidated in payment of debts owed by the subsidiaries and pledged under the Central Gas indenture.

On redemption of the Central Gas bonds collateral securing them will be transferred to the trustee for $20,745,500 of Consolidated Electric & Gas Co.'s collateral trust bonds.

As a preliminary to the proposed financing, Consolidated will sell to Houghton County Electric Light Co. all the outstanding capital stock of Baraga County Light & Power Co., Houghton's generating division. Houghton will later acquire the assets of Baraga through liquidation of the latter. Similarly, Consolidated will sell to Maine Public Service all of the outstanding capital stock of New Brunswick.

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Appalachian Seeks to Buy Pt. Pleasant

Joint application by the Appalachian Electric Power Co. and the Point Pleasant Water & Light Co., Point Pleasant, W. Va., for approval of the sale of all properties of the Point Pleasant Co. to Appalachian for $379,000 in cash had been made to the Federal Power Commission. Approval of the sale has already been granted by the Public Service Commission in West Virginia.

Application states that the Point Pleasant company is engaged principally in the purchase of electric energy from the Appalachian company and its facilities are used to transmit and distribute energy locally to about 2,970 consumers in several West Virginia communities.

United Light & Power Co., parent holding company, is under SEC order to dispose of the Point Pleasant property, through Columbia & Southern Ohio Electric Co., and the latter two companies have made appropriate applications for the purpose of complying with the order.

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Southern Colorado Files Plan With SEC

Southern Colorado Power Co., a subsidiary of Standard Gas & Electric Co., has filed a voluntary plan with the SEC for compliance, under Section 11 of the Holding Company Act, in which it proposes to redeem its $6,736,400 of 6 percent bonds, due July 1, 1947, by the issuance and sale of $5,500,000 of first mortgage, 3½ percent, 30-year bonds and $1,200,000 of ten-year, 3 percent serial notes.

The plan also calls for reclassification of the 42,516 outstanding 7 percent cumulative preferred stock, $100 par; 100,000 shares of class A stock, $25 par, and 75,000 shares of class B no-par common stock into 42,516 shares of new 4½ percent cumulative preferred stock, $50 par, and 638,942 shares of new common, $5 par. The new shares would be exchanged on the basis of one share of new 4½ percent preferred and twelve shares of new common for each share of 7 percent preferred and all arrears; one share of new common for each share of class A common and one-quarter share of new common for each share of class B common.

"Over a period of years," the plan stated, "the earnings of the company have been insufficient to support the present capitalization."

SEC has set July 28 for a hearing on the proposal.

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Great Lakes Power Club Elects New Officers

New officers of the Great Lakes Power Club, elected at the spring meeting in Chicago, are: President, W. M. Woll, Commonwealth Edison Co.; secretary-treasurer, Adolph Schlesinger, Public Service of Indiana; vice-president, R. P. McClellan, Consumers Power Co.

Fall meeting of the club has been tentatively set for November 20.

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Santee-Cooper Producing

The $57,000,000 project of the South Carolina Public Service Authority (Santee-Cooper) went into production officially on July 1, after preliminary runs, with more than enough power under contract, the announcement said, to amortize the authority's $26,000,000 debt.

MEETINGS

Previously Listed

American Institute of Electrical Engineers—Pacific Coast convention, Hotel Vancouver, Vancouver, B. C., September 9-11. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

Pennsylvania Electric Association—Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., September 11. A. B. Millar, managing director, State Street Bldg., Harrisburg, Pa.

International Association of Electrical Inspectors—Northwestern Section, Portland Hotel, Portland, Ore., September 14-16, F. D. Weber, secretary, P. O. Box 70, Portland, Ore. Southwestern Section, Fresno, Calif., September 21-23. H. L. Gerber, secretary, Room 205, City Hall, San Francisco, Calif., Western Section, Book-Cadillac Hotel, Detroit, Mich., October 5-7, F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Eastern Section, Boston, Mass., October 12-14, F. N. M. Squires, secretary, 85 John St., New York, N. Y. Southern Section, Richmond, Va., October 19-21, C. M. Jones, secretary, 307 Trust Company of Georgia Bldg., Atlanta, Ga.

Illuminating Engineering Society—Annual convention, Hotel Jefferson, St. Louis, Mo., September 21-22. Frank G. Horton, executive secretary, 51 Madison Ave., New York, N. Y.

Association of Iron and Steel Engineers—Technical conference, William Penn Hotel, Pittsburgh, Pa., September 22-24. Brent Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

Indiana Electric Association—Business meeting, Indiana War Memorial Bldg., Indianapolis, Ind., September 24-25. R. E. Blossom, secretary, 1414 Circle-Tower, Indianapolis, Ind.

Seasonal Output Decline Sets In

The customary seasonal decline which, in the past few years, has set in beginning with the holiday week of July 4 affected the figures on the amount of electrical energy distributed by the power industry for the week ending on that date. The figures show 3,424,188,000 kw.-hr. distributed for the week as compared to 3,457,024,000 kw.-hr. distributed the week previous (ending June 27), according to the Edison Electric Institute. The decline, however, was slight compared to last year, when, for the corresponding weeks, a drop from 3,156,825,000 kw.-hr. to 2,903,727,000 kw.-hr. was registered. Nationally, the increase over last year's output figures stands currently at 17.9 percent.

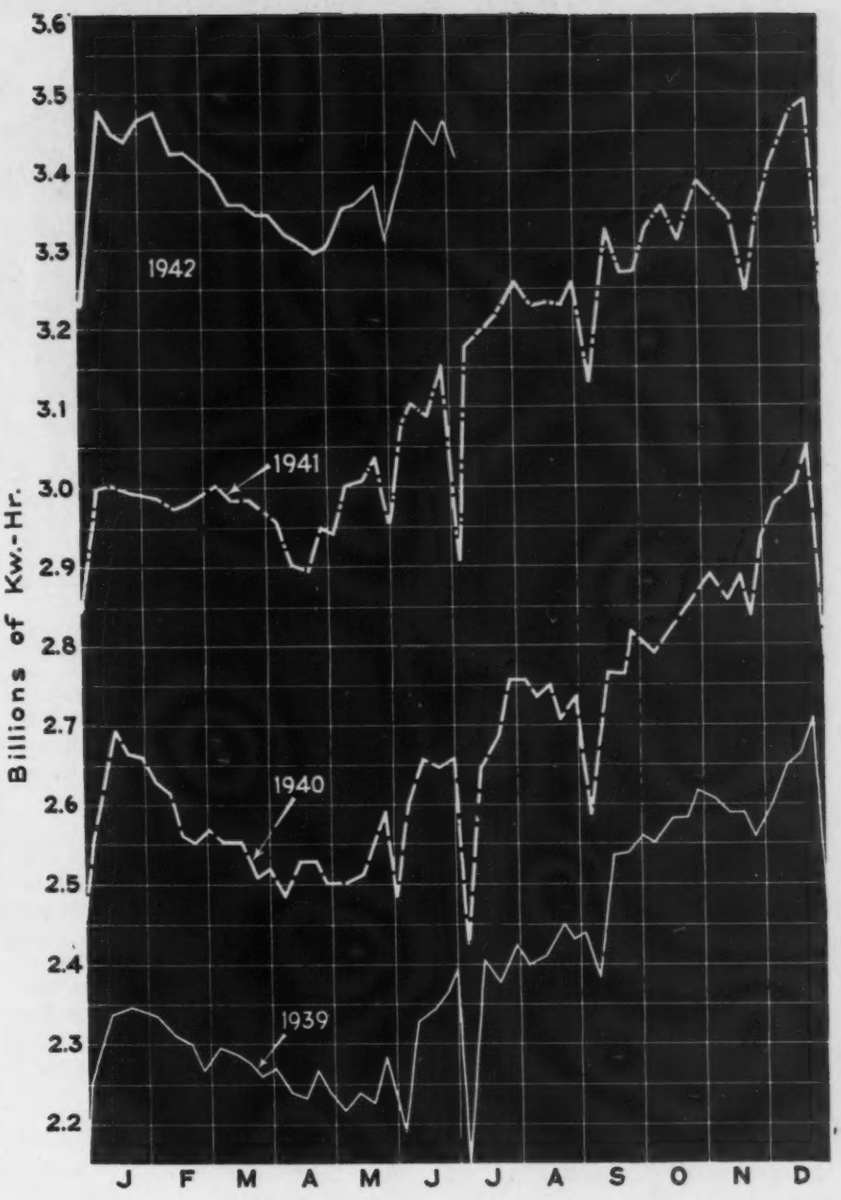
All the seven major geographic regions of the country registered impressive percentage gains over the corresponding week's figures last year. Biggest increases are in the Southern states and the Pacific Coast.

Weekly Output, Millions Kw.-Hr.

1942		1941		1940	
July 4	3,424	July 5	2,904	July 6	2,425
June 27	3,457	June 28	3,157	June 29	2,660
June 20	3,434	June 21	3,091	June 22	2,654
June 13	3,463	June 14	3,101	June 15	2,665
June 6	3,372	June 7	3,076	June 8	2,599
May 30	3,323	May 31	2,955	June 1	2,478
May 23	3,379	May 24	3,040	May 25	2,588
May 16	3,357	May 17	3,011	May 18	2,550
May 9	3,365	May 10	3,003	May 11	2,515
May 2	3,304	May 3	2,944	May 4	2,503

Percent Change from Previous Year

	Week Ending		
	July 4	June 27	June 20
New England	+17.3	+ 3.2	+ 6.1
Mid-Atlantic	+12.7	+ 4.8	+ 6.8
Central Industrial	+15.1	+ 4.3	+ 7.5
West Central	+13.3	+ 4.3	+ 9.9
Southern States	+25.5	+19.9	+19.6
Rocky Mountain	+10.4	+ 4.8	+ 6.3
Pacific Coast	+25.7	+20.7	+17.8
Total United States..	+17.9	+ 9.5	+11.1



Maine Hydro Outlook Much Improved

On June 30 the storage reservoirs of Central Maine Power Co. were all full, while the natural flow of the rivers was still more than enough to operate the company's plants, according to president W. S. Wyman's quarterly statement to stockholders. A year ago the reservoirs on both the Androscoggin and Kennebec rivers were only about two-thirds full and the load was increasing rapidly due to war activities and to demands of customers whose own hydro facilities were short. The excess the company now has in stored water over last year and fuel actually delivered or practically assured is capable of producing about 25 percent of the system's annual requirements.

The initial 20,000-kw. unit at the Mason steam plant (Wiscasset) has been in operation six months. Until the last month, when apparatus for coal burning was installed, the station has been run on fuel oil. At Wiscasset there are now in storage about 43,000 bbl. of fuel oil and 20,000 tons of coal, with 30,000 tons of coal on order. This fuel would operate the plant about a year. At the Bucksport steam plant coal-handling equipment was wanted, but the WPB informed the company that if it received permission to buy this equipment delivery would not be made until 1943.

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December Peak Demands

Utility estimates of peak demands for December, 1942, aggregate 36,200,-162 kw., according to a report issued by the Federal Power Commission. This figure represents an increase of some 255,000 kw. over the forecast made a month ago.

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Hydro Constitutes 36% of May Output

Production of electric energy by water power in May amounted to 5,335,195,000 kw.-hr., or 36.2 percent of the total output for public use, according to a report issued by the Federal Power Commission.

Total electric energy produced for public use in May totaled 14,745,615,-000 kw.-hr., an increase of 10.2 percent over production in May, 1941. Average daily production of electric energy in May was 515,581,000 kw.-hr., an increase of 1.1 percent over average daily production during the previous month.

Utility Stocks Improve; Bonds Also Gain

Prices of electric utility stocks and bonds improved considerably during the past week. "Electrical World" stock index advanced to 18.4 from 18.2 the previous week; last year, 24.1. Bonds—103.0, from 102.5 the previous week; last year, 106.0

FINANCIAL BRIEFS

THE SEC HAS PERMITTED to become effective the amended declaration of National Power & Light under which it would acquire $330,000 face amount of non-callable 50-year, 5 percent collateral trust mortgage gold bonds, due July 1, 1951, of Lancaster County Ry. & Light Co., which bonds have been assumed by National.

WEST TEXAS UTILITIES AND MIDDLE WEST CORP. have filed with the SEC an application for permission for West Texas to purchase all the outstanding securities of Pecos Valley Power & Light Co. which may be deposited in acceptance of its offer. Pecos Valley is a direct subsidiary of Middle West Corp. The commission set July 15 for a hearing.

THE SEC HAS APPROVED a proposal by the Washington Railway & Electric Co. to acquire for cash at $1,000 a share 30,000 shares of the common stock of its subsidiary, Potomac Electric Power Co. The parent company proposes to pledge the 30,000 shares under its consolidated mortgage or deed of trust, dated March 2, 1902. Proceeds will be used by Potomac to finance its construction program.

ELECTRIC BOND & SHARE has filed a certificate in New York state reducing the number of shares of its preferred no-par value stock from 3,379,900 to 3,376,500 shares. The 20,000,000 shares of common stock, $5 par value, remain as heretofore.

GENERAL WATER, GAS & ELECTRIC CO. has called for redemption on August 1, at 100¼ and accrued interest, all of the outstanding General Water Works & Electric Corp. 15-year, 5 percent first lien and collateral trust bonds, series A, due June 1, 1943, according to a plan submitted to the SEC and permitted by the commission to become effective. The Central Hanover Bank & Trust Co., trustee, will take up and pay for the bonds at full redemption price.

EDISON SAULT ELECTRIC CO., a subsidiary of American States Utilities Corp., has filed application with the SEC covering an issue of $990,000 face amount of first mortgage bonds, series A, 3¾ percent, due July 1, 1972, which it would sell to three insurance companies in equal amounts. Approval of the application will mean applying $923,000 to redemption of first mortgage sinking fund bonds, series A and B, due 1961; $42,500 toward reduction of short term bank loans outstanding in the amount of $142,500.

PUBLIC SERVICE CO. OF OKLAHOMA and Southwestern Light & Power Co. have filed SEC petitions to extend to December 31, 1943, the maturity of two notes of Peoples Ice Co. which matured February 15, 1942, in the amounts of $1,462,500 and $625,500, respectively. The notes bear no interest and were issued pursuant to a commission order of December 24, 1941.

Utility Reports

	Net Income 1942	1941
*Alabama Power	$3,266,743	$3,193,080
†American Power & Light and subs.	7,859,892	11,298,367
*Central Maine Power	1,954,496	2,201,382
*Connecticut Light & Power	3,610,326	3,950,375
*Cons. Gas Elec. Lt. & Pwr. (Balto.) and sub	6,546,922	6,161,928
*Consumers Power	8,757,521	10,013,942
*Dallas Power & Light	1,627,639	2,167,731
†Duquesne Light	10,073,573	9,856,714
*Georgia Power	5,338,142	4,866,842
*Kansas Gas & Electric	1,263,846	1,639,052
*Louisiana Power & Light	1,042,888	1,051,449
†Louisville Gas & Electric and subs.	2,832,297	2,845,851
*Montana Power and subs.	3,104,258	3,811,255
*Nebraska Power	1,317,738	1,720,899
*Northwestern Electric	561,109	469,087
*Ohio Edison	3,627,958	3,839,097
*Texas Electric Service	1,017,986	1,214,250

*Twelve months ended May 31.
†Twelve months ended April 30.

Central Maine Files New Financing Plan

Central Maine Power Co. has filed a registration statement with the SEC covering issuance of $14,500,000 first and general mortgage bonds, series M, maturing July 1, 1972; $5,000,000 in ten-year serial notes, maturing serially on July 1, from 1943 to 1952, and 261,910 shares of common stock, $10 par value.

No firm commitment for the purchase of the series M bonds or of the serial notes has been made. The utility proposes to invite sealed proposals for the purchase of such securities, pursuant to the competitive bidding rule of the commission. Details of the bidding commitments will be supplied later by amendment.

The 261,910 shares of common stock are the first to be offered to the holders of the company's outstanding common stock and 6 percent preferred stock for subscription at $10 per share in accordance with their preemptive rights. Central Maine's parent company, New England Public Service, has subscribed for the 261,910 shares, less any shares that may be subscribed by others in the exercise of their preemptive rights.

Net proceeds from the financing, in accordance with the plan recently filed with the SEC, will be used in an extensive refinancing operation involving the redemption of bonds of the Cumberland County Power & Light Co. in a proposed acquisition of Cumberland by Central Maine.

New Tungsten Curb Won't Affect Lamps

Tightening up of the regulations covering allocation and use of tungsten by amendment to Order M-29 does not affect the supply of this material for incandecsent lamps, according to WPB's tungsten branch. Allocation control previously in effect for distribution to lamp manufacturers will still apply under the new order, however.

Serve New Customers

At the end of May, 1942, Consolidated Gas, Electric Light & Power Co. of Baltimore was serving 318,488 electric customers, an increase of 14,117 since June, 1941.

CONVERSION LIGHTING

A Manual of Priority Procedure

Every day that the war is shortened means the saving of lives of our fighting men and the hastening of the time when hundreds of thousands of people can once more face the morning without soul-destroying fear. We must not waste those days.

Nor shall we if we quickly convert to war work the needed thousands of factories that have been supplying less essential civilian needs. Yet, before most of those shops can turn out the components of the tools of war, they must be relighted, so that the human beings who man the machines can devote their finest skill and experience to their tasks.

Lighting does not have to be sold to those in charge of the war production effort. WPB wants these converted plants to have efficient light. But it wants to be sure that the light asked for is needed, that it is adequate, that it does not use one ounce more of critical material than is necessary.

For that reason WPB requires certain information before it will assign a preference rating. The following section is a simple, practical exposition of what is desired and why, fortified with a group of case studies covering a wide range of lighting applications and chosen to show the factors that WPB analysts must consider in rating applications.

While this manual of priority procedure for conversion lighting does not carry official indorsement, the material herein has been prepared with the full cooperation and review of the Lighting and Fixtures Section, WPB.

The editors of *Electrical Contracting* and ELECTRICAL WORLD have prepared this manual to help get the job of conversion done more quickly, thus accelerating war production.

HOW LIGHTING RATINGS ARE HANDLED

WPB SECTION WILL ASSIGN PREFERENCE RATINGS FOR INCREASED LIGHTING FOR WAR WORK IN CONVERTED FACTORIES PROMPTLY UPON SUBMISSION OF FULL INFORMATION PROVING THAT THE MOST LIGHTING BENEFIT IS PROVIDED FOR THE AMOUNT OF SCARCE MATERIALS REQUIRED

By MARSHALL N. WATERMAN, *Chief Lighting and Fixtures Section of Building Materials Branch, WPB*

CONVERSION OF INDUSTRIAL PLANTS from peacetime pursuits to the production of the weapons for waging total war is the biggest job ever undertaken in the United States in so short a period of time. We are taking this conversion route because it is the quickest way to get the necessary increase in production of war material and win the war and because it involves, also, the least drain upon the raw materials which are better used to turn out guns and shells, tanks and planes. Steel used to build new war factories while civilian plants stand in enforced idleness is steel which cannot also go into making tanks, yet tank parts can well be made in converted shops.

Sometimes conversion is a relatively simple operation so far as gearing the working facilities to the war job is concerned. More often, the job is almost as complex as equipping a new plant. But practically always there is a lighting problem involved in plant conversion—the problem of providing the lighting essential to produce the maximum efficiency and the minimum waste. Getting good lighting means arranging for more lighting in almost every instance, and usually not just a few foot-candles more. Rather, it often means a major increase in light intensity.

This is true because war jobs are more precise jobs, demanding closer tolerances and swifter, surer assemblies. The weapons of war must be built to withstand the terrific strains of the battlefield, and it is axiomatic in the armed services that the side with both superior quality and quantity of weapons always wins!

But it isn't only the difference in the work which requires more lighting. Another frequent reason is the need for keeping the job going around the clock in a plant never intended to be so operated. This means a great deal more overtime work, with attendant increased eye-strain. And as the Army and Navy take more and more young men, increased lighting will be required to serve the growing proportion of older workers.

We, in the Lighting and Fixtures Section, realize these things. The section is part of the Building Materials Branch headed by J. L. Haynes, which in turn is a part of the Division of Industry Operations, War Production Board, the agency directing the war production program. It is our job to see that American industry, in converting its facilities to war work, is able to obtain the better lighting that it requires.

But it is also our job as a part of the WPB to see to it that whatever scarce materials which must be used for plant lighting are made to give full value, and the materials required for lighting are among the scarcest—copper, for instance! Just as the WPB as an over-all policy is taking the conversion road to conserve materials for the production lines so, too, must we conserve materials by making sure that what it used for lighting brings the maximum yield in improved illumination.

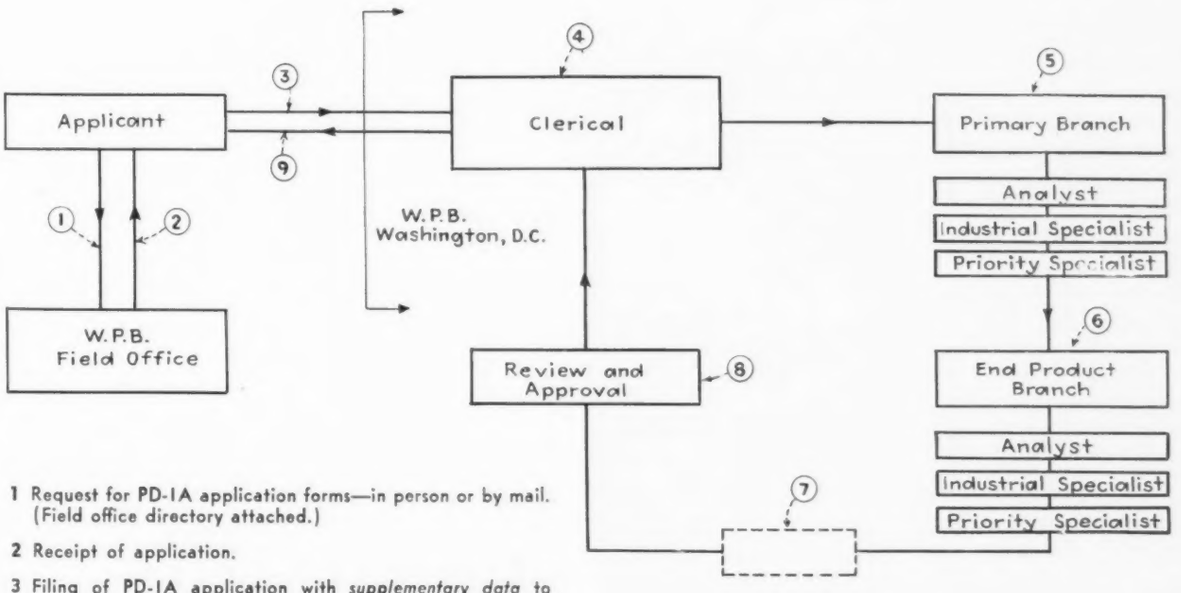
In carrying out this job we recognize what every good lighting engineer knows—that good lighting means increased production, better workmanship, reduction in accidents, etc. We know, also, that the recognized standards of the lighting industry as represented by A.S.A. recommendation are an

excellent guide for production lighting. Also, we realize that the various types of lamps have their parts to play, that sometimes substitution of fluorescent for incandescent will give a significant improvement in illumination without requiring an excessive amount of critical wiring materials and additional power resources, always bearing in mind that there is no general answer and that each job must be analyzed individually.

The Lighting and Fixtures Section is prepared, in proper instances within the over-all priorities structure, to recommend adequate preference ratings for needed equipment of accepted types for improving plant lighting, where this improvement is shown to be for war production work and the proposed lighting design conserves new materials. But if we are to decide wisely we must have the cooperation of those who design and install the new lighting installations. To pass judgment properly upon a proposed relighting job we must have full and detailed information of what changes are proposed and why.

There is nothing complicated about the information we require. It is, essentially, the same information that lighting engineers should themselves require in designing the job. What is it we want to know? Well, what type of work is to be performed in the area to be lighted! Don't simply say "airplane parts manufacturing"—say: "Precision machine work on airplane parts." Tell us the square footage, the ceiling heights, the condition and color of the walls and ceilings. Detail the existing fixtures and give us the present light intensity. If it is a big job—any one involving more than 100 fixtures—prepare a schematic

SIMPLIFIED FLOW CHART—ROUTING OF PD-1A APPLICATIONS



1 Request for PD-1A application forms—in person or by mail. (Field office directory attached.)

2 Receipt of application.

3 Filing of PD-1A application with *supplementary data* to Director of Industry Operations (PD-1A) Washington, D. C.

4 *Incoming (and outgoing) mail sorted, cased, routed, issued, filed, etc.

5 Primary Branch—responsible for industrial plant or establishment in which it is proposed to install new lighting. Recommends importance of plant to war effort.

6 End Product Branch—responsible for products (example—Lighting Fixtures End Product Branch—Lighting Fixtures Section) and manufacturing problems related to those products. Recommends rating that should be assigned. Strips application of unessential material, analyzes, etc.

7 Third Branch—if required, such as materials branch copper, aluminum, etc., if required.

8 Final Review.

9 Application and/or letter returned to applicant: (a) Approved with rating, (b) denied, (c) requesting more complete information. If (c) routing repeats as with new application.

*Certain purely WPB internal operations here and elsewhere in WPB omitted.

wiring diagram, but in any event explain whether existing wiring can be used, and if not what new wiring is required.

These are some of the things to tell us about, always in detail. A complete list of required information has been prepared for use in making lighting applications for priorities and it is more fully discussed elsewhere in this supplement. It should be noted that these data all must be supplied in addition to the standard information required on the rating forms, upon which lighting applications for plant conversions should be made.

We ask all this information because, as I explained earlier, we are charged by the War Production Board with getting every bit of improved lighting possible from the scarce materials which make preference ratings necessary. And to make sure of that we must have information in the same detail that any careful buyer of lighting would require for his own information.

With all this information, what we do is develop the same data that would be provided by a field survey. Lighting applications arriving at WPB are first routed to the branch handling the product which the plant is being converted to turn out—that is, a gun plant lighting application goes to the Ordnance Branch. There the plant conversion job is graded in its relationship with the war effort by the group best acquainted with the manufacturing job involved, and the need for the product made. Then, the application comes to us.

If it is a relatively simple job it goes to a staff analyst for a rating based upon the plant conversion grading, without a detailed lighting engineering study. Other applications go to a lighting specialist who calculates the present lighting values against the proposed values, in accordance with standard formulas. He considers the proposed light distribution and intensity for the kind of work described. He estimates the weights of materials involved as a means of determining the cost in materials of the increased illumination. Finally, he may recommend granting an adequate rating, suggest modification of the design to reduce the use of materials without materially reducing the lighting to be provided, or recommend rejection of the application entirely.

Whether the application goes to the analyst or to the specialist, however, the length of time it takes to get a decision depends largely upon the care with which the applicant has supplied the necessary information. Poorly or inadequately prepared applications simply pile up awaiting further data, while properly prepared requests for priority help are given the right-of-way.

Just a few words to summarize what I have said. As a nation we are converting our industrial production to war production to speed output and save scarce materials. To do the job cut out for them most plants need more lighting. The Lighting and Fixtures Section is prepared to recommend ratings for increased lighting for war work where such redesign provides the most lighting benefit for the amount of scarce materials required. To make sure that materials are being conserved, the section requires certain detailed information in excess of that asked for on the standard rating application blank. Finally, and above all, applications which come to us with all the required information will get a prompt decision; others are simply losing time, generating useless work and delaying war output.

[The PD-1A form is in use as we go to press for conversion lighting applications. It should be noted, however, that the use of particular rating application forms, such as PD-1A, are subject to frequent changes in the complex priorities structure—EDITOR].

PROCEDURE TO FOLLOW

1 . . . Data on existing and proposed lighting is compiled and submitted to owner.
2 . . . Owner submits war pattern information with complete lighting data on PD-1A to WPB, priorities division.
3 . . . Rating is denied or assigned on PD-1A and returned to owner with serial number.
4 . . . Owner extends rating to supplier with purchase order for equipment.

APPROVALS ARE EXPEDITED BY

1 . . . Full PD-1A data and complete lighting data, submitted with original application.
2 . . . High ranking war pattern indicating important war connected production.
3 . . . Urgency of requirements as indicated by substandard existing lighting and night schedules.
4 . . . Compliance with accepted standards of lighting design in new system layout.

DENIALS OR DELAYS ARE CAUSED BY

1 . . . Inadequate information concerning war pattern or inadequate data for analyzing the proposed lighting installation.
2 . . . Excessive requirements in critical materials for lighting equipment, wiring or power resources.
3 . . . Lack of essential need where existing lighting equipment is reasonably adequate for the kind of work performed or where local lighting could readily provide the necessary improvement.
4 . . . Inadequate lighting design when the proposed system offers no significant improvement over the existing lighting installation.

DATA DEFICIENCY SLOWS RATINGS

CONVERSION LIGHTING

APPLICANTS USING PD-1A FORMS for obtaining a preference rating on conversion lighting installations are accustomed to the type of information required on all requests for a rating to obtain capital equipment. Lighting installations for proper analysis and rating require, however, detailed information beyond the scope of that requested in the standard form. The following examples show how information is received by the Lighting and Fixtures Section and how defects in the data slows machinery of rating assignment:

Example "A"—An automobile parts manufacturer converting to the manufacture of landing gear parts for bombers provided full information as requested in the instructions to PD-1A, but simply stated that existing incandescent fixtures would be replaced with fluorescent equipment.

Upon receipt of this request the section analyzer sent back a supplementary questionnaire. The applicant, through information provided by the company handling the lighting installation, returned the details of the lighting installation necessary for the guidance of the analyst and was promptly assigned a rating.

Comment—Submission of the data needed for job analysis with the original application would have permitted analysts to issue a rating nine days sooner.

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Example "B"—Converting a small appliance plant to the manufacturing of small sirens, the applicant stated that he was "obtaining Army and Navy orders," but did not give his "war pattern" or status of existing orders. The rating which he requested to obtain fluorescent lighting fixtures was held up pending more information. At the same time he was asked to provide data on the proposed installation. His existing incandescent lighting was estimated at 5 foot-candles, too low for the type of work contemplated. The data on the proposed installation showed an anticipated intensity of 40 foot-candles. Estimates by conventional formulas showed, however, that the new installation could not provide more than 7.5 foot-candles.

The application was returned with the conditions noted and a suggestion that competent technical assistance be obtained. A later request revised to include 200-watt fluorescent industrial units and estimated to provide 24 foot-candles was received with complete data and a classification of the "war pattern". A rating was eventually assigned.

Comment—Submission of exact "war pattern" with original PD-1A would have cleared the request for analysis. Details of a proposed lighting installation based upon sound engineering practice in layout, design and selection of equipment would have permitted immediate action and rating without delay.

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Example "C"—An applicant requested priority assistance for obtaining a new fluorescent lighting installation to provide 20 foot-candles in an office space. A government was taking over the area, which indicated a good "war pattern" for the job. The work, however, required a comparatively large amount of new wiring materials and the applicant provided only a statement of "approximately 1 to 3 foot-candles lighting from the existing system." A recommendation for rating was withheld until the existing lighting system could be described in greater detail.

The answer brought out the complete data. The space had been occupied by a restaurant which used only a small number of decorative lighting fixtures, explaining the low intensity from the existing equipment and the amount of rewiring necessary. A rating was assigned at once.

Comment—Full data on the existing system explaining the need and providing a measure of the lighting improvement required should have been submitted with the original application. Here the war pattern was good and the request reasonable but only further correspondence brought out the fact that it was essential.

•

Example "D"—A manufacturing plant involved in important sub-contract work on tank parts requested a rating to obtain new fluorescent lighting equipment in a drafting room. The precise workmanship necessary indicated that a relatively high order of illumination was desirable and the system proposed would provide 54 foot-candles. An existing incandescent lighting system consisting of semi-indirect units of a modern type, however, provided a measured intensity of 45 foot-candles. Upon analysis the rating was denied and the application returned.

Comment—Again the applicant failed to show an essential need. The "war pattern" was good, the request was reasonable in that the system proposed was appropriate for the type of work involved. However, the proposed system was not a sufficient improvement in illumination to warrant the use of the critical materials involved.

INFORMATION REQUIRED FOR PREFERENCE RATINGS

CONVERSION LIGHTING installations are considered for preference rating as additions to capital equipment. While some lighting equipment can still be obtained without a high rating, fluorescent equipment requires a rating under recent orders of A2 or higher.

The procedure followed at the present time is: (a) the owner applies for the rating to the War Production Board on form PD-1A; (b) after analysis the WPB either denies the application or issues a rating high enough to obtain the fixtures when required.

Under this procedure, the applicant must provide all the information required by the PD-1A form and, in addition, specific data about the lighting system proposed. The following questions which appear on the instructions for filing a PD-1A should be prepared by the owner of the plant in which the lighting equipment is to be installed. The additional group of questions on the opposite page pertain only to lighting installations and should be answered by the owner with the assistance, if required, of the engineer or contractor in charge of the proposed work.

PD-1A QUESTIONS

NO.

1. Describe product to be produced by you from the material (or capital equipment) for which application is made.
2. Explain use of product to be produced and relationship to War Program, National Welfare, or Government-Sponsored Programs.
3. If you have pending PD-1A application(s) for other material (or capital equipment) required to fill the need for which this application is made, list for each such application (a) description of material (or capital equipment), (b) Date of Application.

4a. If you are operating under any Preference Rating Order(s), "P" Series, applicable to the product with respect to which this application is made, state order number(s) and Serial Number(s).

b. If not, have you made application for any such Preference Rating Order(s), "P" Series? (Identify.)

c. If you are operating under, or have applied for any such Preference Rating Order(s), "P" Series, explain why present application is made.

5. If material (or capital equipment) is required for a single Government contract or a single civilian order for the product, state:

a. Name of Government agency or civilian customer.
b. Supply Arm or Bureau (if Government agency).
c. Complete Contract Number (if Government agency) or Purchase Order Number (if civilian).
d. Quantity of product on contract or on purchase order.
e. Grade of preference rating (if any) assigned to product or contract or on purchase order.
f. If material (or capital equipment) requested or product to be manufactured is destined for shipment outside the continental United States, answer 5a through 5e in full detail including full name and address of customer.

6. If material (or capital equipment) is required for several Government contracts or several civilian purchase orders for the product, state:

a. Names of all Government agencies whose contracts are held.
b. Names of principal civilian customers whose purchase orders are held.
c. Grade(s) of Preference Rating (if any) assigned to product on contract(s) or on purchase order(s).
d. If material (or capital equipment) requested or product to be manufactured is destined for shipment outside the continental United States, answer 6a through 6c in full detail including full name and address of customers.

7. State with respect to each item for which Preference Rating is requested:

a. The shipping date(s) promised by supplier in the absence of a Preference Rating.
b. Names of suppliers (if any) who have refused to accept applicant's order.

8a. State the following with respect to the department in which capital equipment is to be used:

	1st Shift	2d Shift	3d Shift
1. Number of men			
2. Average weekly hours worked			

b. 1. What is the approximate value of the average total monthly output of the department referred to in 8a (based on the quarter immediately preceding the date of this application)?

2. Approximately what percentage of average total monthly output was sold under A-1-a through A-1-c; A-1-d through A-1-j; A2 through A-10?

c. Do you have in use any equipment similar to that for which application is made?

d. If so, what is the average weekly hours of use of equipment referred to in 8c?

e. How do you now accomplish the work for which you require the equipment applied for?

•

ANALYSTS WHO DETERMINE the justification for the new installation under rigid regulations to save the national stockpile of essential war materials need full information. The data should include a clear description of the existing lighting equipment and the proposed new installation together with as much pertinent data as can be provided.

If complete information is not furnished with the application it must be sought by the analyst through correspondence. The consequent delay shows up the heavily burdened government department and holds up the job. The quickest way to obtain a rating for conversion lighting is to provide full information in detail with the application. The additional information desired which pertains to lighting only follows:

CONVERSION LIGHTING

DATA Supplementing PD-1A Application Required in Analyzing Application for Preference Rating

A DESCRIPTION OF AREA

(If more than one Area, all questions should be answered for each separate area)

1. *Physical Characteristics.*
   (a) Dimensions: Width . . . ft. Length . . . ft. Area . . . sq. ft. . . .
   (b) Ceiling Heights . . . ft.
   (c) Reflection Factor (1) Ceiling (light, medium, dark) (2) Side Walls (light, medium, dark)
2. *Type of Work Performed (Required only if not clear in PD-1A Application).*
3. *Types of machines and equipment used.*
4. *Degree of Precision of Workmanship Required.*
   (a) Rough . . . (b) Medium . . . (c) Fine . . . (d) Extra Fine . . .
5. *Electrical System.*
   (a) Type (alternating or direct current)
   (b) Description—phases, wires, voltage, frequency
   (c) Energy—(purchased or generated)
   (d) Connected load in kw. Light and Power separately
   (e) Maximum demand in kw. Light and Power separately
6. *Branch Circuit Wiring.*
   (a) Number of branch circuits
   (b) Size wire and conduit
   (c) If other wiring methods, describe
   (d) Lengths of runs
   (e) Service entrance voltage
   (f) Voltage at socket

B EXISTING LIGHTING CONDITIONS

1. Type of lighting (direct, semi-direct, semi-indirect or indirect)
2. Light source (incandescent, fluorescent, mercury vapor or other)
3. Description of luminaire
   (a) Manufacturer and catalog number. Other description
4. Number of luminaires
5. Number of lamps per luminaire, lamp rating in watts, rated voltage and type designation
6. Metal used in luminaire—aluminum, copper, steel, other in pounds
7. Mounting height (floor to bottom of luminaire) in feet.
8. Spacing of luminaires in feet.
9. Present cleaning and maintenance schedule—describe.
10. Present foot-candles on working plane (space whether measured or estimated).

C PROPOSED LIGHTING INSTALLATION

1. Type of lighting (direct, semi-direct, semi-indirect, or indirect)
2. Light source (incandescent, fluorescent, mercury vapor or other)
3. Description of luminaire
   (a) Manufacturer and catalog number. Other description
4. Number of luminaires
5. Number of lamps per luminaire, lamp rating in watts, rated voltage and type designation
6. Metal used in luminaire—aluminum, copper, steel, other in pounds
7. Mounting height (floor to bottom of luminaire) in feet
8. Spacing of luminaires in feet
9. Anticipated foot-candles.

D WIRING CHANGES REQUIRED

What additional wiring materials, if any, will be required if new incandescent lighting fixtures are used to replace existing lighting fixtures?

E OTHER PERTINENT DATA

1. Can existing fixtures be repaired and re-utilized? If answer is no, what use will be made of existing fixtures?
2. Will the installation of additional lighting fixtures to supplement the existing lighting installation produce satisfactory lighting? If so, what additional material will be required to accomplish this?
3. Can a form of supplementary lighting be used to achieve desired results? If so, what additional materials will be required to accomplish this?

FLUORESCENT LIGHTING IN AN ORDNANCE PLANT

IMPROVED GENERAL ILLUMINATION OF 20 TO 35 FOOT-CANDLES WITH FLUORESCENT UNITS IN MULTI-BUILDING PLANT

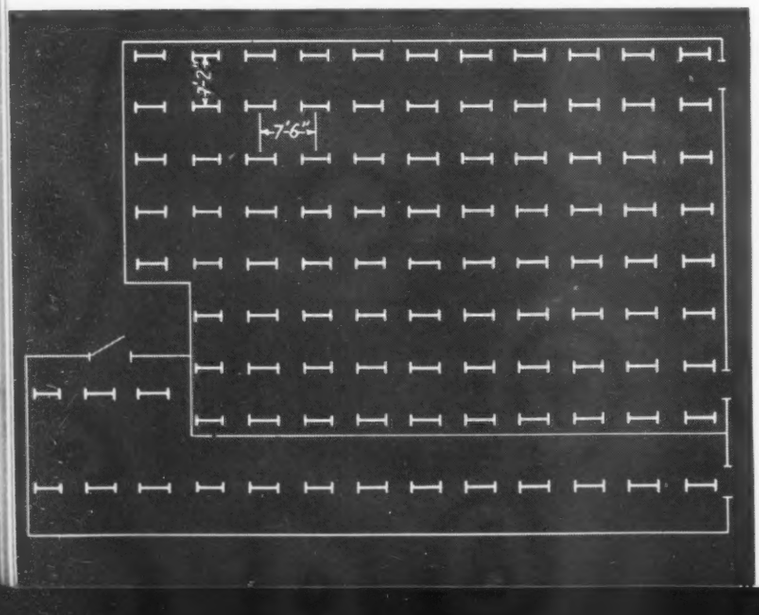
DESCRIPTION OF AREA: The application for priority assistance was made by an agricultural machinery manufacturer during a conversion program. Large areas of the plant which consisted of a number of buildings were converted over a period of several months. Conditions of ceiling and side walls varied though the plant and in general were classified as dark.

EXISTING LIGHTING: The old lighting was inadequate for night shift operation and the closer tolerances in machine work indicated an urgent need for improved illumination.

PROPOSED INSTALLATION: It was proposed to install 1000 fluorescent industrial lighting fixtures with 2 40-watt fluorescent white lamps for general lighting through a large portion of the plant. In each area the lighting intensity was designed to fit the specific production needs by varying the spacing of the fixture as follows:

Area "A" ordnance assembly	7 ft. 6 in. by 7 ft. 2 in.
"B" forging	9 ft. 6 in. by 6 ft. 5 in.
"C" welding	8 ft. 3 in. by 9 ft. 10 in.
"D" machinery	7 ft. 6 in. by 7 ft. 6 in.
"E" balers	6 ft. 8 in. by 8 ft. 4 in.
"F" punching	9 ft. 5 in. by 6 ft.
"G" assembly tank parts	

Anticipated intensities range from 20 to 35 foot-candles. An extensive rewiring job was necessary to provide adequate branch circuit and feeder capacity for the increased lighting load anticipated. This work was already under way at the time application was made for the relighting rating on a previous priority rating.



BUILDING DATA

Area "A"	3,600 sq.ft.
Reflection factor—ceiling	30 percent
walls	30 percent
Ceiling height	14 feet

EXISTING INSTALLATION

Relocation of departments and use of storage space for manufacturing makes existing equipment unsuitable for work to be done in this area.

PROPOSED INSTALLATION (Area A)

New equipment	67 2/40 fluorescent industrial fixtures 134 40-watt white fluorescent lamps
Total lumens	281,400
Room index	"C"
Coefficient of utilization	0.64
Maintenance factor	0.75
Estimated intensity	37 foot candles

PERTINENT DATA: The relighting involved several types of manufacturing directly on war work together with farm equipment ranking as essential civilian manufacturing.

New wiring was required in areas heretofore without lighting equipment such as storage buildings and areas used only in daylight. Existing wiring, feeders, panelboards and transformers were used wherever possible. The maximum demand of the system was estimated at 100 kw. for which sufficient additional service capacity was already installed under the plant rewiring program.

COMMENTS: The war pattern of the applicant was excellent and the existing lighting equipment obviously inadequate for the new war contracts production. Three-shift operation was essential. The proposed lighting system was reasonable in its consumption of critical materials and proposed an important and urgently needed improvement in illumination. A rating was granted.

INCANDESCENT LIGHTING IN A FOUNDRY

IMPROVED LIGHTING FOR NIGHT WORK FROM 3 FOOT-CANDLES TO 25 FOOT-CANDLES WITH INCANDESCENT EQUIPMENT

DESCRIPTION OF AREA: The foundry area for which the rating application was made is used for moulding steel coatings. A lighting intensity of 15 foot-candles was considered appropriate.

Up to the present time, the area had been used only during daylight hours for the operation described. Skylights and wide wall sash provided adequate visibility. Increased production requirements made it necessary to operate in the area 24 hours a day while the available lighting at night is adequate only for shake-out and clean-up.

The area in which new lighting was proposed totals 14,400 square feet. In this area the fixture height is 16 feet over 8,640 square feet and 14 feet over 5,760 square feet.

The ceiling in the entire area is irregular roof construction painted with aluminum paint which with the side walls is considered "dark."

EXISTING LIGHTING: The existing lighting system consists of 35 300-watt enameled reflectors providing measured intensities of 1 to 7 foot-candles, averaging approximately 3 foot-candles. A regular maintenance schedule includes wiping fixtures and lamps with a dry cloth every two weeks and a thorough washing every six months.

Estimated present demand and connected load is solely for lighting and totals 11 kw.

PROPOSED INSTALLATION: The applicant submitted a lighting plan proposing an installation of 108 500-watt incandescent lamps in glass shielded porcelain enameled reflectors to provide an average intensity of 15 foot-candles.

PERTINENT DATA: Twelve of the existing fixtures can be repaired and will be used in other plant areas. Wiring, as a result of work started in 1940 is adequate for the increased load involved. Local lighting is impractical as the entire area must be kept clear for crane operation and overhead monorail carriers.

BUILDING DATA

Total area lighted	14,400 sq.ft.
Area "A"	8,640 sq.ft.
Area "B"	5,760 sq.ft.
Reflection factor—ceiling	30 percent

EXISTING INSTALLATION

Equipment—
35 enameled steel reflectors in deteriorated condition
33 300-watt lamps
2 500-watt lamps

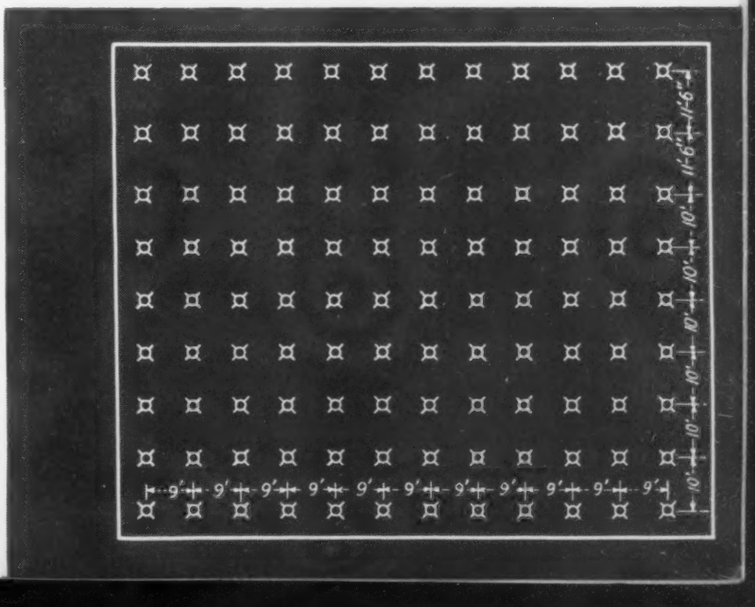
Mounting height Area "A"	16 feet
Mounting height Area "B"	14 feet
Connected load	11 kw.
Total lumens	209,750
Measured foot-candles	1.0 to 7.0
Reported average foot-candles	3

PROPOSED INSTALLATION

New equipment—
108 porcelain enameled bowl type reflectors with glass covers
108 500-watt incandescent lamps

Total lumens	1,080,000
Estimated intensity	25 foot candles
Connected load	54 kw.

COMMENTS: An analysis of the type of orders handled by the plant showed the work to be essential to the war program. The present lighting installation was inadequate for the work performed and the fixtures were in a deteriorated condition. The applicants anticipated 15 foot candles was apparently derived from a load proportion. Analysis by conventional formulas based on new equipment showed 25 foot-candles. The applicant was granted an adequate rating.



CONTINUOUS FLUORESCENT IN MOTOR MANUFACTURING

INCREASE REQUIRED FROM EXISTING 10 FOOT-CANDLES INCANDESCENT LIGHTING WITH MINIMUM INCREASE IN POWER CONSUMPTION

DESCRIPTION OF AREA: In a factory area to be used for the manufacture and assembly of small dynamotors, turret motors and searchlight motors for the armed forces. Ceiling and side walls were classified as medium in reflection characteristics.

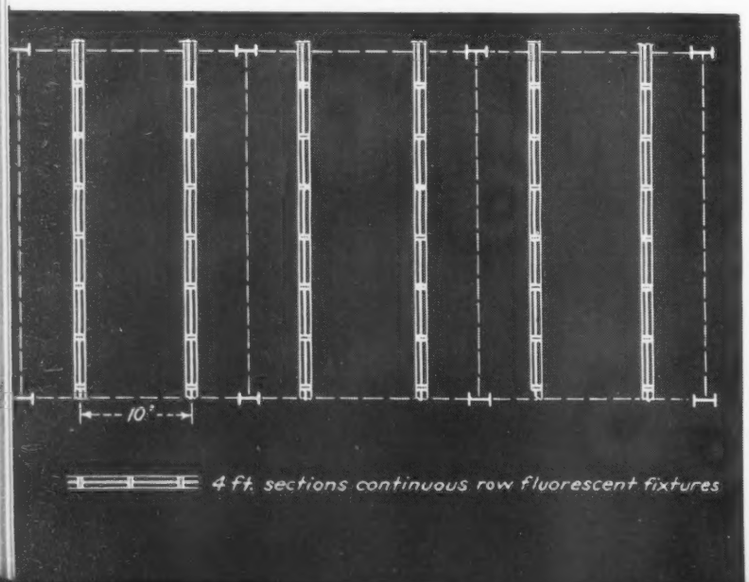
EXISTING LIGHTING: The applicant reported an existing installation of 328 300-watt glassteel diffusers serving an area of 48,600 square feet and providing a reported intensity of 10 foot-candles. A regular cleaning and maintenance schedule provided for washing the fixtures every three months.

Estimated existing kilowatt demand was 98 kw. of lighting and 585 kw. of power; connected load was 98 kw. lighting and 1,140 kw. power.

PROPOSED INSTALLATION: The proposed new lighting installation was for continuous rows of 2-lamp fluorescent units installed in the area to replace the existing filament equipment. Existing fixtures were removed for reinstallation in other parts of the plant.

The continuous rows of 4-ft. units were to be installed 10 feet above the floor on lines 10 feet apart providing an estimated 50 foot-candles over the area with 1,310 fixture units.

BUILDING DATA	
Area in sq.ft.	48,600
Ceiling height	14' 6" to 25' 6"
Reflection—	
Ceiling	50 percent
Side walls	30 percent
EXISTING INSTALLATION	
Equipment	328—300-watt glassteel diffusers 328—300-watt incandescent lamps
Intensity	6—10 foot-candles (reported)
Total lumens	1,886,000
Reported intensity	10 foot-candles
PROPOSED INSTALLATION	
Anticipated load	127 kw.
Lighting proposed	1,310 2-lamp, 48-inch fluorescent industrial fixtures in continuous rows 2,620 40-watt white fluorescent lamps
Room index	"C"
Coefficient of utilization	0.64
Maintenance factor	0.75
Total lumens	5,502,000
Estimated intensity	54 foot-candles



PERTINENT DATA: An increase in the proposed lighting capacity with incandescent lighting units would require extensive rewiring and new feeders resulting in a lighting load of approximately 328 kw. while the same lighting intensity according to the applicant's report can be provided in the proposed installation with 127 kw. Local lighting would not satisfy the needs as it would provide too sharp contrasts between the lighted area and the dark surroundings and in many cases it would be physically impractical to apply.

COMMENT: While calculation indicated that about 15 foot-candles could be obtained from the existing system, the 50 foot-candles system proposed was desirable for the nature of the work. This installation required only a slight increase in wiring capacity, power consumption and demand. The existing lighting equipment was scheduled for use elsewhere in the plant. Consequently analysts recommended a rating for the project.

FLUORESCENT LIGHTING IN AN OFFICE BUILDING

MODERNIZATION OF THE LIGHTING SYSTEM IN A LARGE OFFICE BUILDING FOLLOWS LEASING OF SPACE TO WAR CONTRACTORS

DESCRIPTION OF AREA: In a large office building, the applicant wished to carry out a lighting modernization plan in offices taken over by government agencies and war suppliers. Portions of the area are occupied by engineering firms as drafting rooms, other sections are devoted to general office work.

EXISTING LIGHTING: The existing incandescent lighting system consisting of direct diffusing glassware and 200-watt lamps provided 7 foot-candles. The ceilings are painted a flat white and side walls a light ivory. A regular maintenance schedule provides for dusting fixtures every month and soap and water washing every six months.

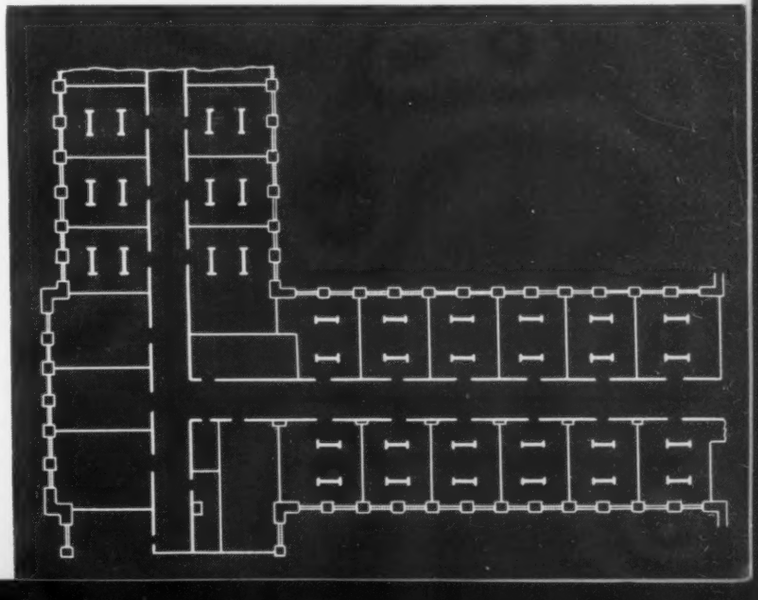
PROPOSED INSTALLATION: Under the lighting modernization plan, half of each wing on six floors was scheduled to be relighted with suspended fluorescent fixtures of the egg-crate louver type. Half of the units were specified for six 40-watt lamps and half with four 40-watt lamps. The number of units required for the program totaled 1,200.

The office building wings are divided into 300-sq. ft. bays partitioned into separate offices with two outlets in each space on 10-ft. centers. The reported anticipated lighting intensity was approximately 20 foot-candles.

PERTINENT DATA: Under a previous rating 300 fixtures had been obtained to start the program. An additional 900 were required. Many of the engineering offices are now operating on a 16-hour schedule requiring long hours of work without supplementary daylight. The total building connected load is 3,500 kw., 2,500 of which is lighting. It was estimated that the fluorescent installation would save approximately 350 kw. over an incandescent installation to provide adequate illumination.

BUILDING DATA	
Total area lighted	approximately 150,000 sq.ft.
Reflection factor—ceiling	75 percent
walls	50 percent
Ceiling height	12 feet
EXISTING INSTALLATION	
Each 300 sq.ft. bay	2 diffusing globes 2 200-watt incandescent lamps
Reported intensity	7 foot candles
PROPOSED INSTALLATION	
New equipment Each 300 sq.ft. bay	1 4 lamp louvered unit 1 6 lamp louvered unit 10 40-watt fluorescent lamps
Total lumens	21,000 per bay
Mounting height	9 feet
Room index	"E"
Coefficient of utilization	0.40
Maintenance factor	0.65
Estimated intensity	18.2 foot-candles

COMMENTS: As the modernization program of this applicant was keyed to space occupied by war connected business and government offices the war pattern is good. The existing lighting is not adequate for detailed office work and an increase in lamp sizes would seriously overload the wiring system capacity. The type of units specified could be installed without extensive changes in wiring or additional power resources. A rating was assigned to the project.



FLUORESCENT LIGHTING IN A CLINICAL LABORATORY

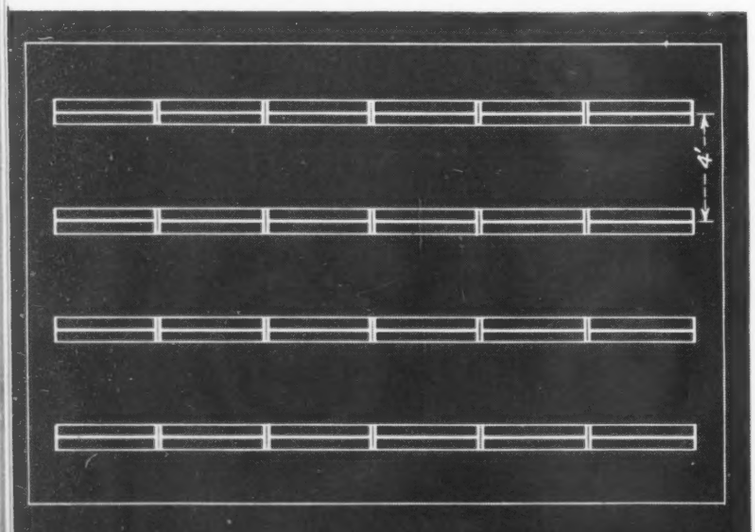
IN A REMODELED HOSPITAL WARD, NEW CONTINUOUS FLUORESCENT CEILING UNITS PROVIDE AN ESTIMATED 44 FOOT-CANDLES

DESCRIPTION OF AREA: A hospital submitted a request for priority assistance to obtain new fluorescent lighting equipment for a clinical laboratory. The space previously occupied by a hospital ward, was recently remodeled and equipped for laboratory work.

The room is 26 feet long and 17 feet wide, totalling 442 square feet. Ceiling and side walls were painted a flat egg shell white providing excellent reflection factors. Ceiling height is 13 feet.

EXISTING LIGHTING CONDITION: The ward lights, consisting of indirect bowls equipped with 150-watt lamps and a 10-watt blue lamp for night lighting, were reported as inadequate for the exacting work of the laboratory and were removed during remodeling for use in other parts of the hospital.

PROPOSED INSTALLATION: The application requested a rating for an installation of surface mounted, continuous row fluorescent luminaires consisting of a wiring channel, and a glass diffusing enclosure made up in four foot sections with two 40-watt fluorescent lamps. An average illumination intensity of 40 foot-candles was anticipated and was to be aided wherever necessary by local lighting from special laboratory equipment.



BUILDING DATA

Total lighted area	442 sq.ft.
Ceiling height	13 ft.
Reflection factors—ceiling	75 percent
walls	50 percent

EXISTING INSTALLATION

Lighting equipment	4 bowl type indirect suspended fixtures 4 150-watt incandescent lamps

Area remodeled from hospital ward and units used elsewhere in same building.

PROPOSED INSTALLATION

New equipment	24 2/40-watt direct diffused fluorescent lighting units 48 40-watt white fluorescent lamps
Unit spacing	Continuous rows 4 ft. apart
Room index	"H"
Coefficient of utilization	0.30
Maintenance factor	0.65
Mounting height	13 ft.
Total lumens	100,800
Connected load	2,100 watts
Estimated intensity	44 foot-candles

PERTINENT DATA: The application included a tabulation of the amounts of critical materials required for the new lighting installation and reviewed the types of seeing tasks involved under wartime conditions. This data, while not essential for the rating request, emphasized its urgency.

Additional wiring required for the lighting system was already installed under a separate rating. The power resources, derived from the hospital's power plant, was sufficient to handle the additional load without added equipment.

COMMENTS: Existing lighting equipment in the area was obviously unsuitable for the critical seeing tasks of a clinical laboratory. The type of lighting unit proposed, while providing good diffusion and light control uses relatively small amounts of critical materials and no additional allocations of scarce materials were needed for the wiring. The essential character of the use, the urgency, and the satisfactory design of the lighting installation were established. The hospital authorities were granted a rating.

FLUORESCENT LIGHTING IN A TEXTILE MILL

CONVERSION OF A WEAVE DEPARTMENT TO 24-HOUR SCHEDULES ON REQUIRED LIGHTING IMPROVEMENT PROVIDED BY INDUSTRIAL UNITS

DESCRIPTION OF AREA: A textile mill requested a rating to obtain new fluorescent lighting in a weave shed. The area involved totalled 9,000 sq. ft. with a 14 foot ceiling. Reflection factor of 75 percent for the ceiling and 50 percent for the side walls were reported based upon white and light gray paint respectively.

EXISTING LIGHTING: The existing lighting provided approximately 6 foot-candles from 100-watt lamps on drop cords, about half equipped with reflectors of an obsolete type in poor condition, inadequate for three shift operation. The connected load was 7.2 kw. of lighting and 89.5 kw. of power.

PROPOSED INSTALLATION: The new installation proposed by the applicant would provide an estimated 25 foot-candles from 2/40 fluorescent industrial fixtures on the same outlets.

PERTINENT DATA AND WIRING CONDITIONS: In the area where this plant is located there is a potential power shortage due to extensive conversion and capacity operation of equipment in the surrounding mills. It was considered undesirable to increase the connected load if it could be avoided. Fluorescent lighting provided an opportunity to increase the effective illumination without materially increasing the demand. Existing wiring, while in some need of repairs, was adequate to serve the new lighting system.

A similar installation in another part of the mill had contributed to definite increase in production, improved quality and better working conditions.

COMMENTS: The war pattern of this mill was excellent, almost 100 percent A-1-j or better. The power supply conditions in the area were critical and increased illumination from additional incandescent lighting would require a significantly large increase in demand. The new lighting system proposed was a large increase in illumination, however, analysis indicates that the resulting illumination will be less than the anticipated 25 foot-candles reported. The project was assigned a rating.

BUILDING DATA

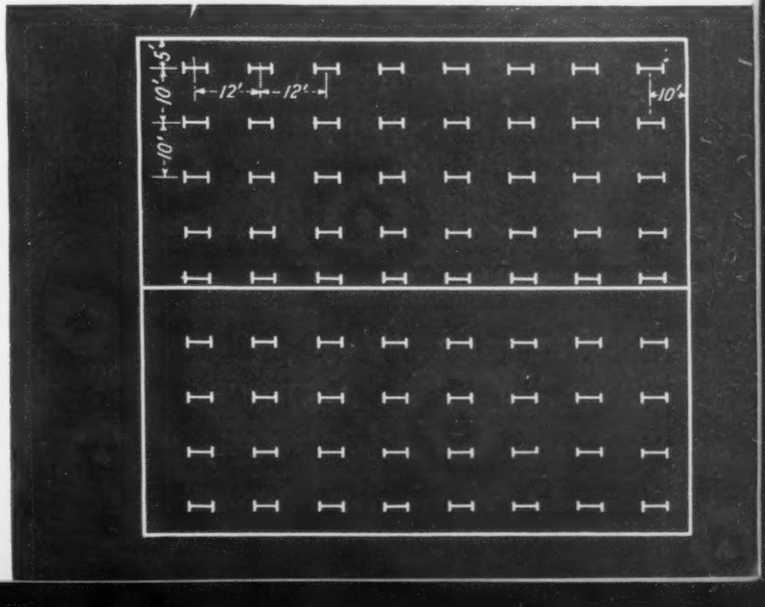
Total area lighted	9,000 sq.ft.
Reflection factors—ceiling	75 percent
walls	50 percent
Ceiling height	14 feet

EXISTING INSTALLATION

Present equipment	72 drop cords, approximately half with cone reflectors 72 200-watt incandescent lamps
Average intensity	6 foot-candles
Maintenance	regular cleaning
Connected load	7.2 kw. lighting 89.5 kw. power

PROPOSED INSTALLATION

New equipment	75 2-40 industrial fluorescent fixtures 150 40-watt white fluorescent lamps
Mounting height	11 feet
Total lumens	315,000
Room index	"A"
Coefficient of utilization	0.74
Maintenance factor	0.75
Estimated intensity	19.4 foot-candles
Estimated load	7.5 kw.



FLUORESCENT LIGHTING IN A FORGE SHOP

NEW LIGHTING UNITS IN A TEMPORARY STRUCTURE WITHOUT EXISTING LIGHTING PROVIDES 17 FOOT-CANDLES FOR A FORGE DIE ROOM TO ALLOW EFFICIENT NIGHT SHIFT OPERATIONS

DESCRIPTION OF AREA: The applicant requested a rating to obtain new fluorescent lighting equipment for a new die room addition at a forge. Recent large war orders were requiring 24-hour operation in the plant and additional die room space.

The addition is a frame structure 14 feet high covering an area of 2,544 square feet. The interior surfaces are natural wood unpainted ceilings and side walls. The reflection characteristics were classified as relatively dark and for the purpose of estimating probable lighting intensities were indicated as 30 per cent for ceiling and 50 per cent for walls.

EXISTING LIGHTING CONDITIONS: As the structure is new, no lighting is yet installed in this area. The kind of lighting equipment to be installed also determines the wiring layout and feeder capacity required.

PROPOSED INSTALLATION: The proposed layout involves 24 new 2/40 fluorescent industrial lighting fixtures spaced on 10 by 10 foot centers and suspended 10 feet from the floor. Under existing reflection factors the anticipated intensity as reported in the application is approximately 20 foot-candles.

BUILDING DATA

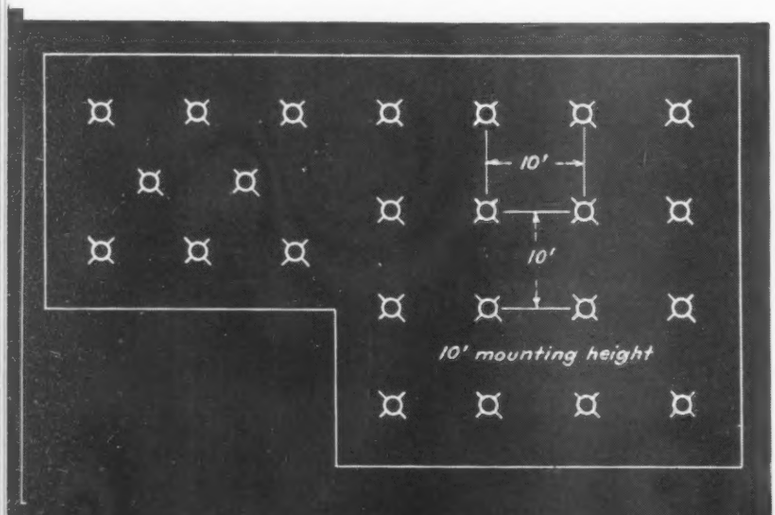
Total area lighted	2,544 sq.ft
Ceiling height	16 ft.
Reflection factor—ceiling	30 percent
walls	30 percent

PRESENT INSTALLATION

No existing lighting in this area

PROPOSED INSTALLATION

New equipment	24 2/40-watt industrial fluorescent units 48 40-watt fluorescent lamps
Spacing	10 by 10 feet
Height	10 feet
Total lumens	100,800
Room index	"B"
Coefficient of utilization	0.67
Maintenance factor	0.65
Estimated intensity	17.2 foot-candles
Estimated load	2.4 kw.



PERTINENT DATA AND WIRING CONDITIONS: The war pattern of the orders handled in this plant are 71 per cent A-1-a, 10 per cent A-1-b, 17 percent A-1-f to j and 2 percent other. The need for lighting in the area was urgent. New wiring required was being installed and materials obtained under a separate rating. The space is already in use and night shifts must use portable lamps to work in the area. A new incandescent installation of equal intensity would require more wiring, panelboards and a heavier feeder circuit.

COMMENTS: The applicant has a very high ranking war pattern, almost 100 percent A-1-j or better. The new wiring is being installed under a separate rating. Incandescent equipment would require larger quantities of scarce material for wiring and service. The installation designed is satisfactory for the type of work involved. A rating was assigned for the project.

FILAMENT INDIRECT LIGHTING IN AN OFFICE

NEW LIGHTING IN AN AREA USED BY A GOVERNMENT WAR AGENCY PROVIDES MODERATELY IMPROVED ILLUMINATION USING PREVIOUSLY INSTALLED ADDITIONAL WIRING CAPACITY

DESCRIPTION OF AREA: An office area rewired in 1936 but never equipped with fixtures, was to be taken over by a local administrative office of one of the government war agencies. The area, a portion of a large office building, covers 9,025 square feet. The ceilings are 11 feet high finished in flat white paint. The side walls are a light ivory.

PROPOSED NEW INSTALLATION: The lighting system proposed for priority rating was an installation of semi-indirect incandescent lighting units to be mounted on the existing outlets. This type of lighting unit had been adopted as a standard throughout the building.

With 94 units of 300 watts each the anticipated intensity of the proposed installation was 18 foot-candles under the good reflection characteristics of the surrounding white ceilings and light ivory walls.

The estimated demand and connected load for the new lighting was 30 kilowatts. No significant power load was anticipated in the area.

PERTINENT DATA AND WIRING CONDITION: Existing feeder capacity and branch circuits are designed to handle the type of lighting system proposed. Power is purchased from the local utility company and the building is located in an area where there is ample distribution and generating capacity. The area is wired with 4 outlets to each 16 by 20 foot bay with one branch circuit per bay. Runs between outlets are No. 12 with No. 10 home run to the panelboards.

EXISTING LIGHTING CONDITIONS: Old fixtures designed for 200-watt lamps and producing a maximum of 7 foot-candles on the working plane had been discarded at the time of rewiring.

BUILDING DATA

Total area lighted	9,025 sq.ft.
Reflection factors—ceiling	75 percent
walls	50 percent
Ceiling height	11 ft.

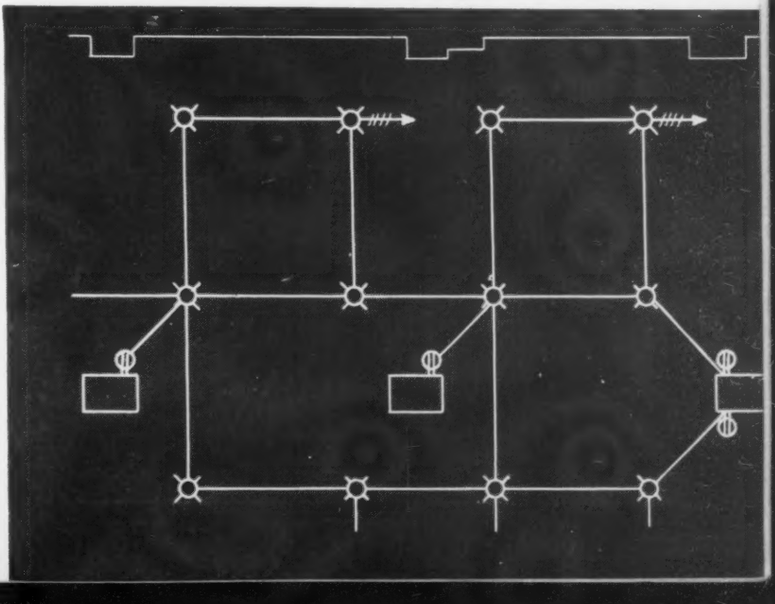
EXISTING INSTALLATION

No fixtures now installed. Rewiring in 1936 provides four outlets in each 20 by 16 foot bay.

PROPOSED INSTALLATION

New equipment	94 semi-indirect incandescent lighting fixtures 94 300-watt incandescent lamps
Total lumens	540,500
Room index	"C"
Coefficient of utilization	0.42
Maintenance factor	0.65
Mounting height	8-ft. 6-in.
Estimated foot-candles	16.4
Estimated load	30 kw.

COMMENT: The new lighting system was required for an essential government office and the request for priority assistance based upon a moderate amount of new materials. There are ample power resources in the area for the additional load. The anticipated lighting of 18 foot-candles reported was considered reasonable for the type of work to be handled in the area. A rating high enough to obtain the required fixtures was granted.



FLUORESCENT UNITS IN A SHOE FACTORY

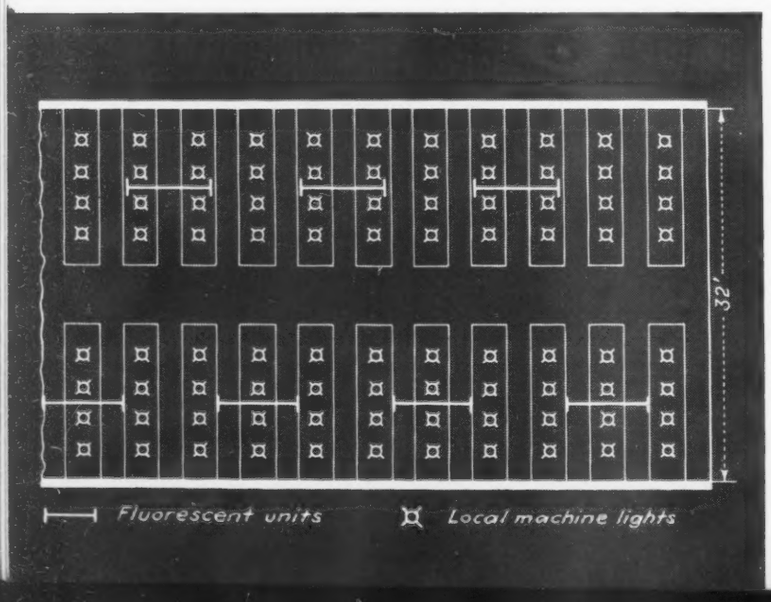
FLUORESCENT UNITS REPLACE INCANDESCENT ON EXISTING OUTLETS TO IMPROVE GENERAL LIGHTING FOR NIGHT SHIFT OPERATION

DESCRIPTION OF AREA: In a shoe manufacturing plant heavy government orders were requiring round-the-clock production. The ceiling is unpainted open joists. Side walls are painted gray to a height of 4 feet above the floor and white to the ceiling. Reflection characteristics of the ceiling are low while the side walls are medium.

EXISTING LIGHTING: In a stitching department, the general lighting averaged 7 foot-candles aided by local lighting at the stitching machines which was restricted to small bright areas. The consequent contrast with the comparatively dark surroundings was great. Existing general lighting was reported as 200-watt porcelain enameled steel reflectors and 200-watt incandescent lamps on 15 foot centers. The fixtures were suspended from drop cords to a height of 10 feet above the floor providing a measured lighting intensity of 5 to 7 foot-candles. The connected load for the area was 6 kw.

PROPOSED INSTALLATION: The new lighting proposed for the stitching area was an installation of 2-lamp 4-ft. fluorescent industrial fixtures installed on the existing lighting outlets at the same height as the present fixtures. This layout would provide an estimated average general illumination of 15 foot-candles according to the applicant's report, a significant improvement over the existing lighting, without requiring additional wiring or feeder capacity.

BUILDING DATA		
Total lighted area		6,855 sq.ft.
Ceiling height		12 ft.
Reflection factors—ceiling		30 percent
walls		50 percent
EXISTING INSTALLATION		
Lighting equipment	30 enameled steel reflectors on drop cords 30 200-watt incandescent lamps	
Total lumens	111,000	
Reported intensity	5 to 7 foot-candles	
PROPOSED INSTALLATION		
New equipment	50 2/40-watt industrial fluorescent lighting units 100 40-watt white fluorescent lamps	
Total lumens	210,000	
Room index	"C"	
Coefficient of utilization	0.60	
Maintenance factor	0.75	
Estimated intensity	15 foot-candles	



PERTINENT DATA: The existing fixtures can be used in other parts of the plant in halls and aisle areas where no lighting is now provided. No additional wiring is required for the proposed lighting installation as existing circuits and feeders have sufficient capacity. The connected load for the fluorescent units is estimated at about 1 kw. less than the present lighting load.

COMMENTS: The new fluorescent lighting installation can be made without adding wiring capacity. The existing lighting levels are considerably inadequate for the type of work involved. The estimated 15 foot-candles from the proposed installation is not as high as existing standards recommend; however, it is an effective improvement in lighting over that existing. The request was granted a rating.

HOW DESIGN . . . CONSTRUCT OPERATE MAINTAIN

To Speed Up Capacitor Mounting

Prior to installing a number of line type capacitors on its distribution system for power-factor correction the Brockton Edison Company set up a typical outdoor layout within easy reach of the ground on a pole in the service station yard for the benefit of linemen in familiarizing themselves with the arrangement of these units in the field, which were to be standard for all installations. In the set-up nine 15-kva. tanks were mounted on angle-iron and strap brackets attached to standard crossarms, with cut-out box and lightning arrester connections and taps to phase wires as indicated. The spacings adopted by the company were maintained, and this demonstration layout proved useful in instructing employees in making such installations quickly and with a resulting close acquaintance with field requirements. The installation was for temporary use only, the capacitor units ultimately being destined for service on the system, but it was relatively inexpensive to erect and salvage on a 100 percent basis for regular distribution circuit applications.

•

Electronic Device Warns of Bomb Impact

An electronic device for giving immediate warning of the impact of an incendiary bomb, which depends for its action on the sound transmitted through the structure, incorporates reliability, ease of testing and low cost, according to the *Electrical Review*.

Vibrations are picked up by one or more thin iron plates (No. 24 British Standard Wire Gage) secured to the roof or ceiling and transmitted along tensioned galvanized iron or piano wires (No. 18 SWG) to a main plate to which a microphone is fixed. This microphone is connected in a circuit with a battery and two relays, the second of which operates an alarm bell if the noise is from a bomb, but is insensitive to gunfire and low-flying aircraft.

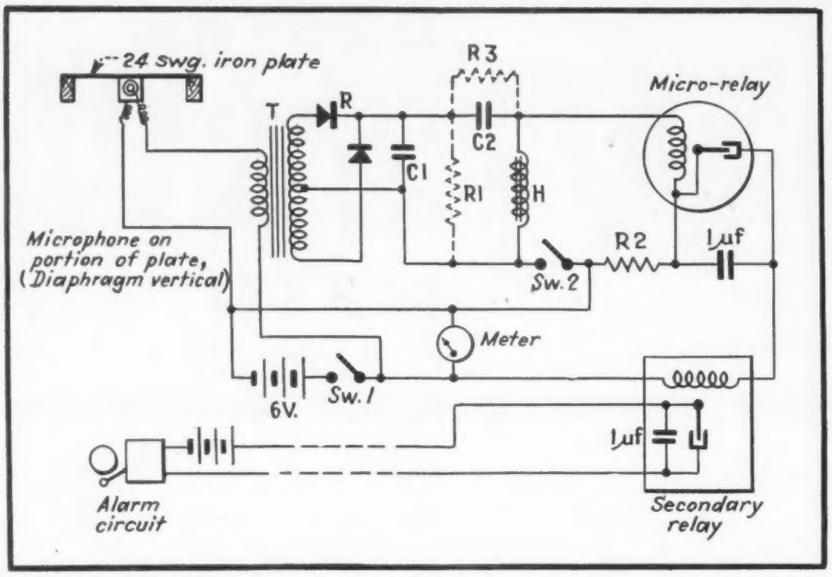
Noise produced by bomb impact contains a large number of frequencies from very low to very high, while that from gunfire is deficient in the higher frequencies. Thus its effects can be eliminated from detection by using a microphone with a very poor low-frequency response—an inexpensive midget carbon-button type.

Insensitive to Planes

Operation of the detector by aircraft can be prevented if the alarm is made sensitive to sudden noises only. This is accomplished by rectifying the output from the secondary of the microphone transformer, smoothing somewhat with a condenser and then applying the resultant to a micro-relay through a condenser so that the deflection of the moving arm is proportional to the rate of change of voltage.

Noise from the bomb actuates the micro-relay, momentarily closing the contacts. This sends a surge through the secondary relay and feed-back resistance, This resistance is in the micro-relay circuit; potential drop across it sends a current through the micro-relay via the choke coil, which prevents the output from the rectifier being short-circuited. Thus a small surge through the micro-relay closes

CAPACITOR LAYOUT set up to aid linemen



INCENDIARY BOMB ALARM gives immediate warning of bomb impact

Component parts indicated on circuit diagram; "R," full-wave rectifier; "R1," resistance for reducing sensitivity (optional); "R2," feedback resistance for keeping relays closed; "R3," resistance for increasing sensitivity (optional) of about 5,000 ohms; "H," 50-henry choke; "SW1," battery switch; "SW2," reset switch; "T," microphone transformer; "C1," 0.5-mfd. condenser; "C2," 0.10-mfd. condenser. Device can be made extremely sensitive by short-circuiting the 10 microfarad condenser and omitting the smoothing condensers and choke. Meter is moving-vane milliammeter with full-scale deflection of about 20 milliamp.; when needle falls below 5.5 battery requires recharging.

the two relay circuits permanently until the reset switch is opened.

The moving system of the micro-relay must have a very low moment of inertia. A closing current of 50 micro-amp., with a 1,000-ohm coil resistance and a very small moving coil, is suitable. To lessen the possibility of uncertain contacts in the micro-relay, a higher voltage can be used in the secondary circuit—supplied from small grid-bias batteries—and the current reduced with a resistance.

If the alarm is to be in operation only during blackout hours, it may be switched on by turning on the battery switch and then the reset switch and switched off by reversing the process.

•

Idle M.-G. Sets Serve New Purposes

By separating the motors and generators of two spare 1,500-kw. motor-generator sets Detroit Edison Company has put otherwise idle equipment to effective system use and avoided the purchase of new apparatus. Generators of the two sets were connected two-in-tandem to a 3,144-kw. turbine at one of the company's plants to provide d.c. house service. The synchronous motors from the sets were utilized as synchronous condensers for power-factor correction at a remote substation. The generator half of the machine bases were cut off, the center bearing pedestal, which was not required on the turbine-generator combination, was retained for the motor and the end bells altered to improve ventilation. Bearing thermostats were installed and the conversion was complete.

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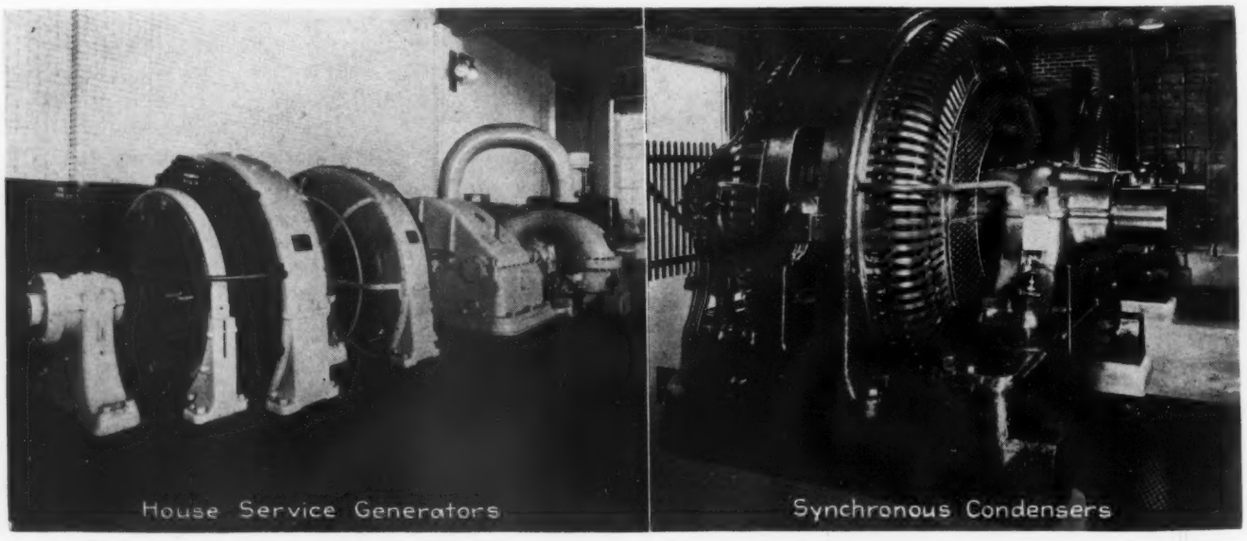
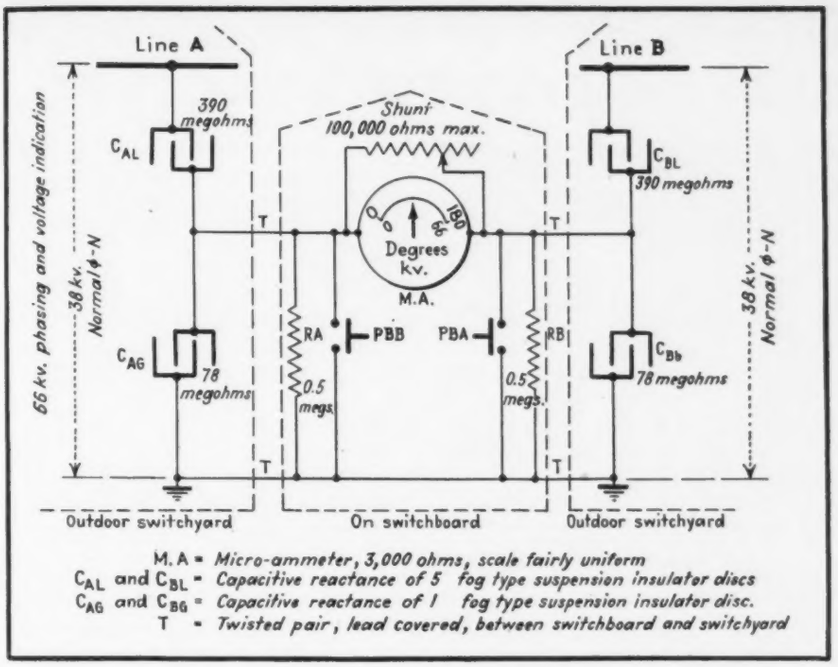
Micro-ammeter Shows Synchronism, Voltage

By H. R. STEWART
Protection Engineer, New England Power Service Company, Boston, Mass.

There are many instances on lines and buses at sub-transmission voltages (22 to 66 kv. inclusive) where potential supply is not needed for metering or relaying, but is desirable for synchronizing, live line indication, rough voltage indication, ground detection, etc. The great sensitivity of the Rectox micro-ammeter makes it possible to secure any or all of the four features mentioned without the use of expensive potential transformers, since the capacitance charging current of suspension insulator strings is adequate to produce full-



COMPONENTS of motor-generator sets find new uses



CONNECTIONS of micro-ammeter for voltage indication and synchronizing

scale deflection on a 100-microampere instrument.

The diagram shows schematically how such an instrument has been connected for voltage indication on each of a pair of 66-kv. lines, and for checking synchronism or synchronizing between them. Each of the two six-unit insulator strings consists of fog-type units to minimize variations due to weather, the micro-ammeter tap lead being made to the cap-and-pin hardware between the ground end unit and the next one in the string. Arcing rings set 26 in. apart effectively prevent the arc of an insulator string flashover from contacting the micro-ammeter lead and primary voltage from being communicated indoors to the switchboard. To eliminate transverse electromagnetic and electrostatic induction, the micro-ammeter leads from the outdoor structure to the switchboard are twisted-pair, lead-covered. The micro-ammeter scale is calibrated both in phase-to-phase line kv. for use when reading voltage on either line, and in angular degrees for use when checking synchronism or synchronizing between the two lines.

The distance between the outdoor switchyard and the switchboard may be several thousand feet, without seriously affecting the accuracy of the indications, provided the two sets of connecting leads are of closely equal characteristics.

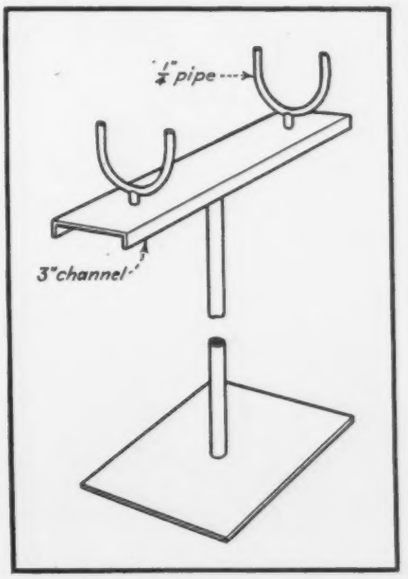
The tabulation shows how the push buttons PBA and PBB are handled in operation and the instrument deflections to be expected under various conditions. When the two lines are out of synchronism the instrument needle swings rythmically between 0 deg. (in-phase) and 180 deg. out-of-phase positions, in distinction to the continuous rotary motion of a conventional synchroscope.

It is necessary to connect the micro-ammeter to insulator strings on all three phases of a circuit if ground detection is desired. If identification of the grounded phase is wanted, it is necessary to use three micro-ammeters or switch one from phase to phase, but if phase identification is not required one micro-ammeter connected between the commoned insulator string taps and ground suffices. With the latter connection a null reading is obtained when all three phase voltages are balanced to ground, but an up-scale deflection appears when any phase becomes grounded.

Manipulation of Push Buttons PBB and PBA, with Instrument Deflections to Be Expected Under Various Conditions

Condition	Operation	Position of		Microamperes in								
		PBA	PBB	C_{AL}	C_{AG}	C_{BL}	C_{BG}	RA	RB	PBA	PBB	Microam.
Both lines alive and in phase	Check A-1 alive	C	O	98	0.004	98	0	0.6	0	195.4	0	97.4
	Check B-2 alive	O	C	98	0	98	0.004	0	0.6	0	195.4	97.4
	Check phase.	O	O	98	0.6	98	0.6	98	98	0	0	0
A-1 line alive, B-2 line dead	Check A-1 alive	C	O	98	0.004	0	0	0.6	0	97.4	0	97.4
	Check B-2 alive	O	C	98	0	0	0	0	0	0	98	0
	Check phase.	O	O	98	0.3	.06	0.3	49.3	48.7	0	0	48.7
Both lines alive, 180° out of phase	Check A-1 alive	C	O	98	0.004	98	0	0.6	0	0.6	0	97.4
	Check B-2 alive	O	C	98	0	98	0.004	0	0.6	0	0.6	97.4
	Check Phase.	O	O	98	0.002	98	0.002	0.3	0.3	0	0	97.7
Both lines alive, 90° out of phase	Check A-1 alive	C	O	98	0.004	98	0	0.6	0	139	0	97.4
	Check B-2 alive	O	C	98	0	98	0.004	0	0.6	0	139	97.4
	Check Phase.	O	O	98	0.4	98	0.4	69	69	0	0	69

Cradle Holds Bushing Shells



In the maintenance shops of Oklahoma Gas & Electric Company, Oklahoma City, bushing shells are laid in a simple cradle as illustrated while porcelain is cleaned and ends painted. It is used also to support assembled bushings while weather casing and shank are cleaned.

HOW TO REPRESENT SYSTEM REACTIVE

By W. W. PARKER
Switchgear Engineer
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

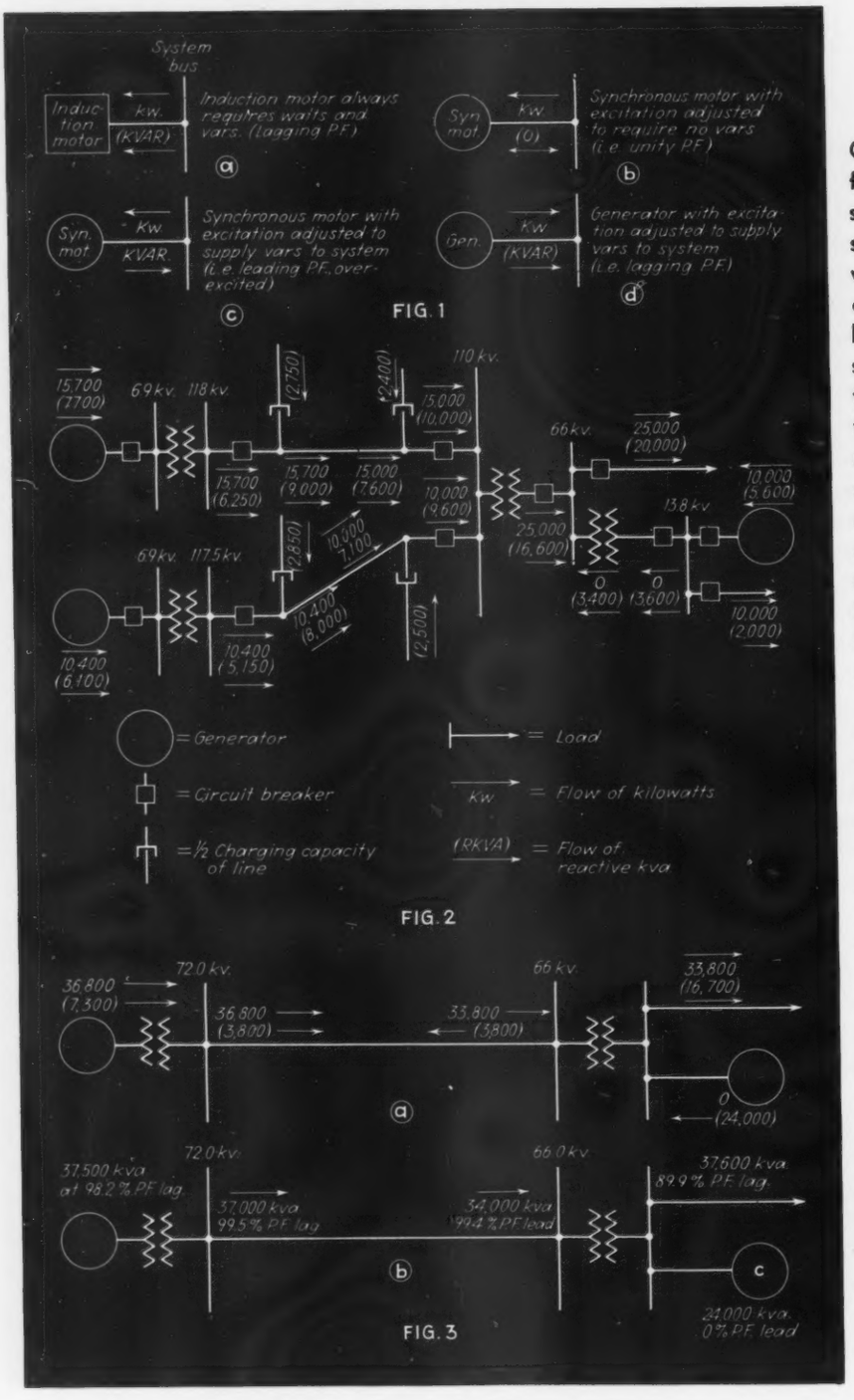


Fig. 1—Reactive flow consistently shown as magnetizing—needed or provided.

Fig. 2—Such representation of power flow in a typical system is superior to indicating (1) kva. and power factor as lagging or leading; (2) kw. and power factor as lagging or leading; (3) amperes and power factor as lagging or leading; (4) kw. and kilovars ($P \pm iQ$)

Fig. 3—Recommended method (a) of representing power flow in this system shows at a glance and by simple subtraction that line loss is 3,000 kw. and kvar required in the line is 7,600; (b) presentation of volt-ampere distribution in terms of kva. and power factor is less readily interpreted

CONFUSION in thinking of power flow relations can be avoided by considering kilowatts and kilovars as separate and distinct quantities, each with its own (1) supply, (2) direction of flow, (3) "loss" and (4) use at the load. Increasing kilowatt demand on systems has resulted in the tendency to utilize full kva. capacity of generators to supply kilowatts where the most economical steam is available and prime mover capacity is available. In such cases the kilovars must come from other sources such as static capacity, line charging capacity and from synchronous apparatus. System studies can clearly present such conditions for analysis.

When kilowatts and kilovars are considered as having separate identities the results are easily comprehended and simple to check (Fig. 1). Power is plotted directly in figures with an arrow to show direction. Vars are shown in parentheses with a separate arrow. Lagging power factor is always indicated when the arrows for both kilowatts and kilovars are in the same direction and leading power factor when the arrows are in opposite directions.

When the results of a system study are presented with vars and watts treated separately (Fig. 2), it is very easy to check the work, as Kirchoff's laws hold at all junctions for watts and independently for vars. With any other method (for example, Fig. 3). checking and analysis are much more difficult.

Certain fundamentals of power system operation are made very clear by the use of this method. It emphasizes the fact that vars are a necessary quantity which must just as surely be supplied and dispatched through the system as watts; *i.e*, kilovars I^2X must be supplied just as surely as kilowatts I^2R.

Essential INDUSTRIES Need TIREX Cables

ESSENTIAL industries, either directly or indirectly on war work, demand enormous quantities of flexible cords and cables for portable equipment and tools. The use and abuse that flexible cords and cables get, even under normal working conditions. is a severe test of their toughness and resistance to abrasion. For high-pressure, defense production electrical tools and machines need the most dependable power supply that can be provided.

TIREX — rubber sheathed — Cords and Cables have built up a remarkable record of economical, efficient performance during the past twenty years. These flexible, portable power lines have delivered energy in mines for loaders, drills, cutters and locomotives; in quarries for shovels and conveyors; in shipyards for welders, riveters and small tools; in industrial plants for a wide variety of electrically operated tools and machines.

The experience gained in keeping TIREX in the front rank since 1920 enables us now to adjust manufacturing processes to comply with restrictions on the use of copper and rubber and still produce flexible, rubber insulated, rubber sheathed conductors worthy of the TIREX name. But they still are available only for essential industries on war work. Orders must include preference ratings and such other information as is needed to permit us to use the rubber, copper and other restricted materials that go into them.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

Simplex WIRES and CABLES

Flexible Power Supply to Boiler Auxiliaries

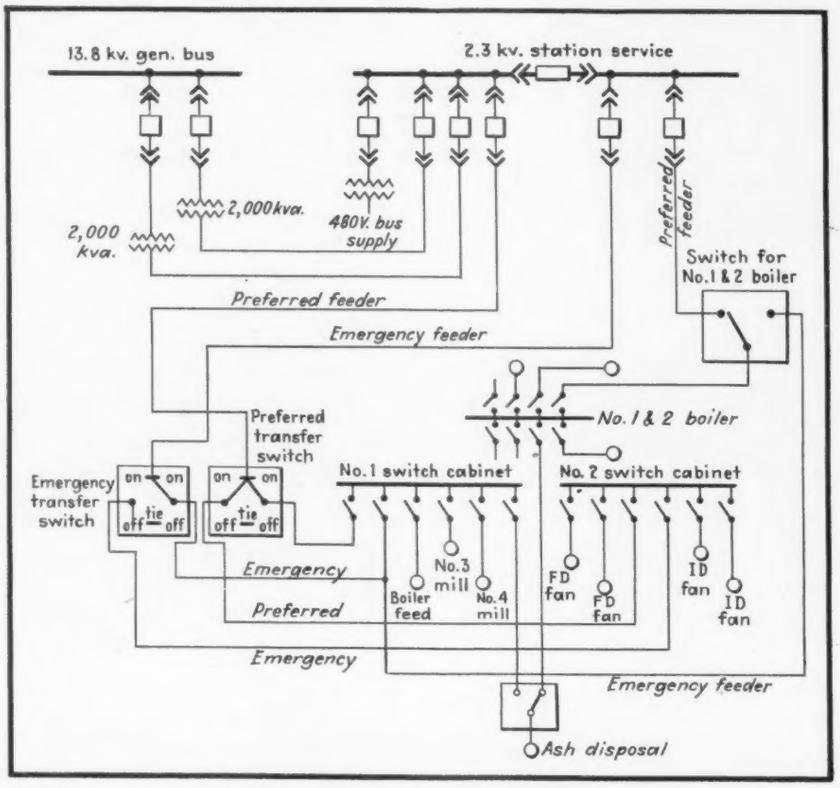
Flexibility of power supply to boiler room auxiliaries has been assured at the Cedar Rapids plant of the Iowa Electric Light & Power Company through ingenious arrangement of oil-filled preferred-emergency transfer switches shown in the accompanying schematic diagram.

Preferred and emergency 2,300-volt feeders, tapping the station service bus, supply two switch cabinets on the boiler operating floor from which feeders radiate to the forced- and induced-draft fans, boiler feed pumps and pulverizing mills for the new 300,000-lb.-per-hour, 650-lb. boilers recently installed at this plant.

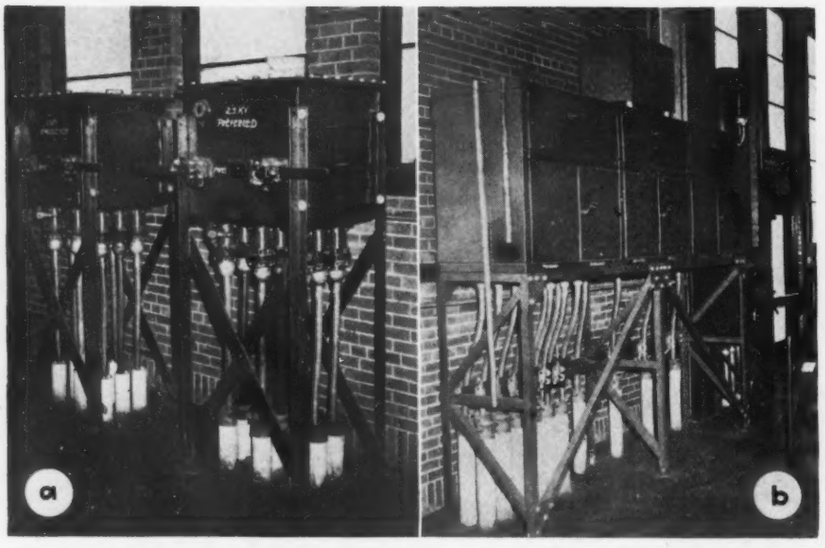
Oil-filled transfer switches in these preferred and emergency feeder circuits make it possible to feed either or both switch cabinets from either feeder, in the event the other feeder fails. Also, since the preferred and emergency feeders are carried through from both transfer switches to each of the No. 1 and No. 2 switch cabinets, both of these switch cabinets can be fed from either transfer switches in the event of a fault on cabinet feeders.

The diagram shows also how duplicate feed has been made available to boiler Nos. 1 and 2 auxiliaries by direct connection to the 2,300-volt station service bus and indirect connection to the transfer switches and switch cabinets previously mentioned.

Physical arrangement of preferred and emergency transfer switches and one of the two switch cabinets (No. 1) is shown in the accompanying illustrations.



POWER supply system for Cedar Rapids boiler auxiliaries

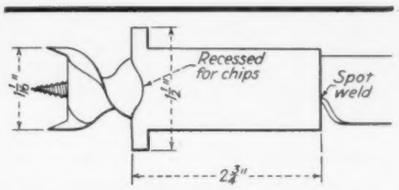


FOUR-POSITION oil-filled transfer switches (a) are key to flexibility of both auxiliary power supply; switch cabinets are shown at (b)

•

Bit Depth Gaged for Reflector Buttons

Reflector buttons in some states are required on poles located within 8 ft. of the metallized strip of main highways. In placing them at the prescribed height one Eastern company has had the work done by linemen with climbers rather than by using a ladder, because the lineman's belt gives better purchase for the boring operation. However, much trouble was experienced in getting the uniform depth of hole because the depth gage clamped to the bit would loosen and lead to variations and loss of buttons projecting and subject to tampering.



GAGE ON BIT gives fixed depth of hole for pole reflector buttons; sleeve has a 1/32-in. wall with a 3/16-in wide flange at the bit end

This company devised a depth gage welded to the bit so as to give a permanent setting for the desired depth of the Peerless 1-in. buttons used. Incidentally, this company places the buttons also on angle poles along highway curves to avoid collisions with such strain poles in case the autoist interprets a break in the sequence of reflector buttons as a side road or a resumption of tangent road.

IRVINGTON WIRE MARKERS make it easy to identify terminals by numbering them to conform with blue prints of wiring diagrams. Used as sleeves over terminal wires, *Irvington Wire Markers* show prominent numerical indexes. They are marked in black on bright yellow tubing, which is varnish-impregnated inside and outside. After printing, the Wire Markers receive several protective coatings which make them oil- and gasoline-proof. Because of this treatment, the identifications will not come off when motors are washed with gasoline. In addition, the markers are not affected by heat. For engine ignition systems and machine tools, *Irvington Wire Markers* eliminate die stamping of wire terminals and the use of metal tags, thus conserving metal and avoiding a frequent cause of short circuits. Prominent aircraft and other engine manufacturers simplify their terminal wire identification with *Irvington Wire Markers.*

Irvington Wire Markers come in two standard lengths—1/2" and 7/16"; two diameters—nominal I.D. .263" or .294"; and two sizes of symbols. Special I.D. sizes also can be furnished. For complete range of symbols and other data, write Dept. 46 for Product Information Sheet EL-70. Prices will also be sent on request.

IRVINGTON

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Plants at Irvington, N. J. and Hamilton, Ont., Can.
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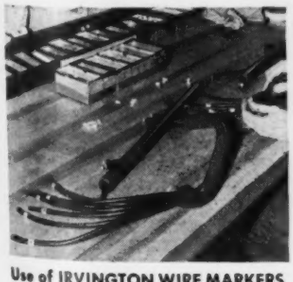
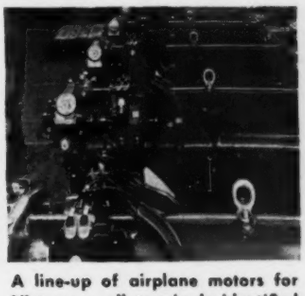
Irvington Wire Markers Meet Army & Navy Specification AN-9513



Use of IRVINGTON WIRE MARKERS by a leading aircraft manufacturer, showing simplicity of application.



A line-up of airplane motors for Victory — all terminals identified with IRVINGTON WIRE MARKERS.

A famous aircraft engine manufacturer uses IRVINGTON WIRE MARKERS for terminal identification.

IRVINGTON WIRE MARKER on this lug is covered with TRANSFLEX Transparent Insulating Tubing.

Memphis Has Uniform Transfer Bus Scheme

One basic transfer bus arrangement, shown diagrammatically, is used in all the distribution substations of the Memphis Light, Gas and Water Division, Memphis, Tenn., to provide a reserve supply for feeders during routine maintenance of feeder breakers and regulators or for emergency switching.

The arrangement used at Memphis has the advantages of (1) providing maximum flexibility with a minimum of switchgear, (2) simplicity of operation, (3) lending itself to neat compact physical layout and (4) avoiding needless duplication of equipment.

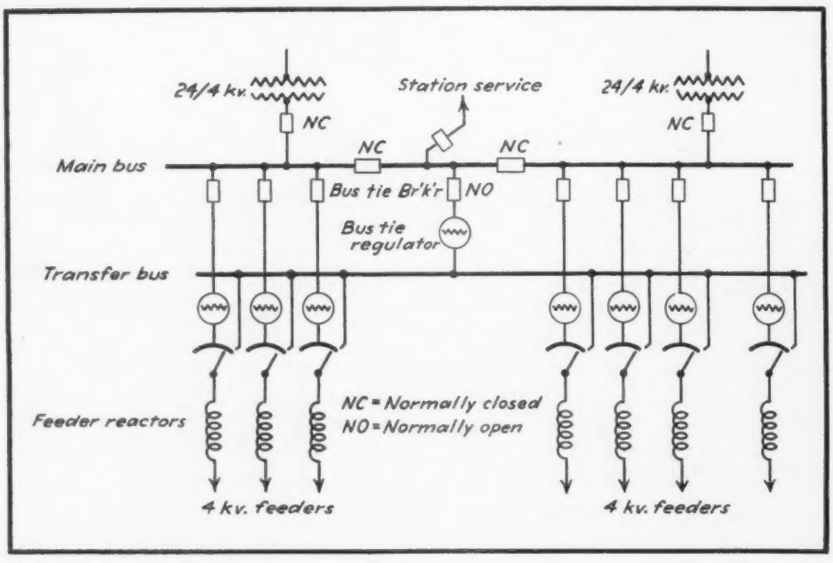
Each substation has two 4-kv. buses, a main and transfer bus. The main bus is in three sections, two of which are supplied by separate 23/4-kv. outdoor transformer banks. The third section, a short "stub" flanked by normally closed tie breakers connecting it with the other two main bus sections, provides the means of connecting either main bus section with the transfer bus. This connection is through a bus tie breaker (normally open) and a bus tie regulator.

TYPICAL feeder regulator compartment: portion of transfer bus housing at extreme left

TRANSFER bus housing: quadrant switches are behind wire glass windows like one in foreground

Feeders are normally supplied from the main bus through a feeder breaker, regulator and a quadrant type transfer switch, by means of which the feeder can be changed over to the transfer bus.

When it is desired to remove any feeder breaker and regulator from operation for maintenance the operations are as follows: (1) Close bus tie breaker; (2) run the bus tie regulator to the same setting as the feeder regulator being removed from service (this must be done before the quadrant switch interlocks will permit it to be operated); (3) operate the quadrant type transfer switch; this switch closes the feeder onto the transfer bus before it opens the connections to the main bus; (4) open feeder breaker on main bus.



SCHEMATIC DIAGRAM of basic transfer bus scheme used by Tennessee utility

Revolving Churn Cleans Oil Drums

With the supply of oil drums affected by the wartime steel shortage it is wise to take good care of those on hand. They may have to last a long time.

To this end Oklahoma Gas & Electric Company, Oklahoma City, has devised an ingenious churn-like device that has mechanized the cleaning of used transil oil drums.

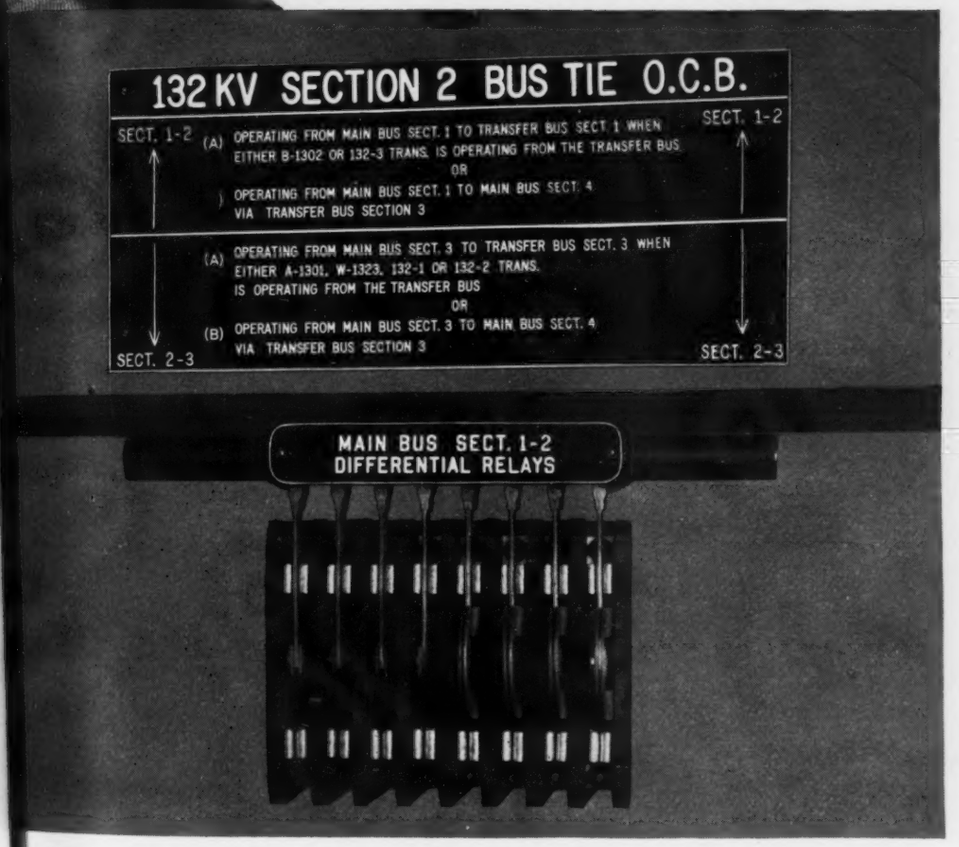
USED transil oil drums cleaned, rinsed and relacquered in ingenious churn

After being emptied the inside of the drum is carefully inspected. If the inside coating of lacquer is destroyed, or the drum rusted, cleaning solution such as Oakite or naphtha is put inside and the drum rotated in the drum churn for five minutes. When the solution is drained off two gallons of lacquer are put in and the drum again rotated, painting itself in the process. If the lacquer inside the barrel is not found to be damaged the barrel is simply rinsed with clean transil oil.

The drum churn, that makes cleaning easy, is shown. The drum is held in a clamp frame attached to a hori-

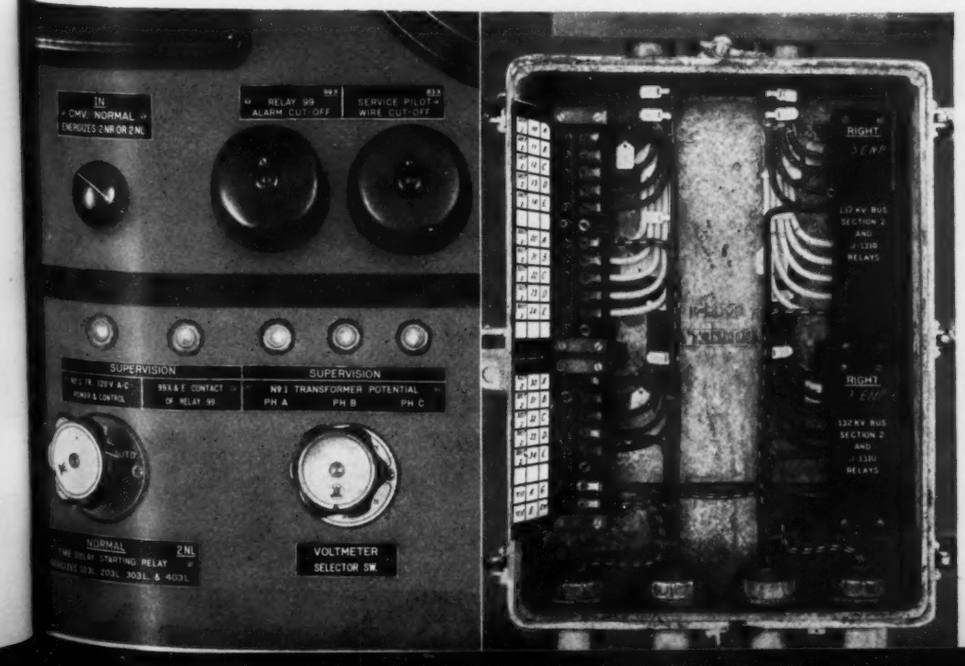
LAMICOID

for clear, permanent identification of controls


132 KV SECTION 2 BUS TIE O.C.B.
SECT. 1-2
(A) OPERATING FROM MAIN BUS SECT. 1 TO TRANSFER BUS SECT. 1 WHEN EITHER B-1302 OR 132-3 TRANS. IS OPERATING FROM THE TRANSFER BUS
OR
OPERATING FROM MAIN BUS SECT. 1 TO MAIN BUS SECT. 4 VIA TRANSFER BUS SECTION 3
SECT. 1-2
(A) OPERATING FROM MAIN BUS SECT. 3 TO TRANSFER BUS SECT. 3 WHEN EITHER A-1301, W-1323, 132-1 OR 132-2 TRANS. IS OPERATING FROM THE TRANSFER BUS
OR
(B) OPERATING FROM MAIN BUS SECT. 3 TO MAIN BUS SECT. 4 VIA TRANSFER BUS SECTION 3
SECT. 2-3
SECT. 2-3
MAIN BUS SECT. 1-2 DIFFERENTIAL RELAYS

Above and below. The function of panels, dials, controls, switches and equipment is fully identified and explained with clean-cut lettering and calibration on Engraving Lamicoid.

Below. Hinged panels, shown open and closed in this junction box, use white Lamicoid (left) —with a finish for writing on with ink—and black engraved Lamicoid with a finish suitable for writing on with chalk.



SUPPLANTS METAL FOR EQUIPMENT PANELS

Any standardization program for clearly identifying control panels, switches, junction boxes and other units of equipment subject to human control is complicated from the production standpoint by the fact that frequently no two signs are alike.

Public Service Electric Gas Company, however, have found an ideal solution. As shown in the illustrations, Engraving Lamicoid (laminated plastic sheet material) is used. Letters are routed through the black surface, exposing the white opaque core. Identification panels and dials are permanent, easily fabricated and extremely legible. Original lustre is retained simply by wiping with a damp cloth.

More than 25,000 of these attractive signs were installed last year by Public Service—at a lower cost than would be possible by any other comparable method.

Mica Insulator Company

200 Varick St., New York; 600 W. Van Buren St., Chicago; 1276 W. 3rd St., Cleveland. *Representatives at* Birmingham, Boston, Cincinnati, Los Angeles, San Francisco, Seattle. *Canada:* Montreal, Toronto.

Lamicoid is available for indentification of controls, etc. in three materials, with the following characteristics:—

ENGRAVING LAMICOID

—A "sandwich-type" sheet in which letters, figures and designs are engraved through the opaque surface exposing the contrasting core. Available with an Opaque core or a Translucent back for rear illumination.

TRANSLUCENT LAMICOID

—A translucent sheet admirably suited for dials and other applications requiring rear illumination. Easily curved, machined, printed or sandblasted.

GRAPHIC LAMICOID

—A durable sheet material in which printing, lettering, diagrams, etc., are permanently incorporated and cannot be removed or erased. Opaque or Translucent—and with a finish suitable for writing on with pencil or ink.

zontal shaft turned by a ½-hp., 1,800-r.p.m. motor through a speed reducer (taken from a motor-operated air-break switch). The drum revolves end over end on the motor-driven shaft while it rotates on its own axis. This is accomplished by means of a V-belt which runs over a stationary pulley on the motor shaft and drives a pulley clamped to the drum as shown in the illustration.

•

Protective Lighting for Power Plants

The matter of protective lighting for power plants on the Pacific Coast is being given intensive study both by the utilities and the governmental authorities. While no standard plan has been evolved, to be strictly applied to each and every plant, a number of fundamental principles are now pretty well agreed upon, and these principles are being adapted to plants in that area in a manner to suit the conditions of the various cases.

Summed up, these principles involve:

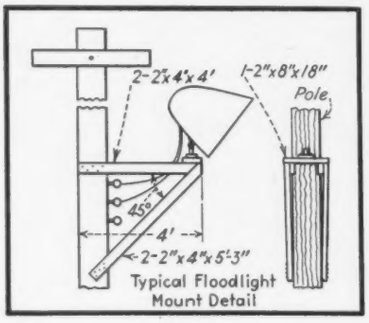
1. A suitable fense surrounding the building and 20 ft. or more outside of the walls.

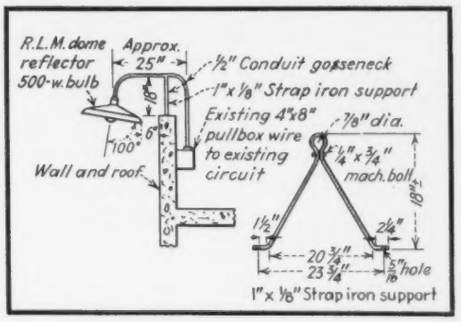
2. An area of high illumination outside of the fence produced by floodlight units facing outward and mounted over or nearly over the fence.

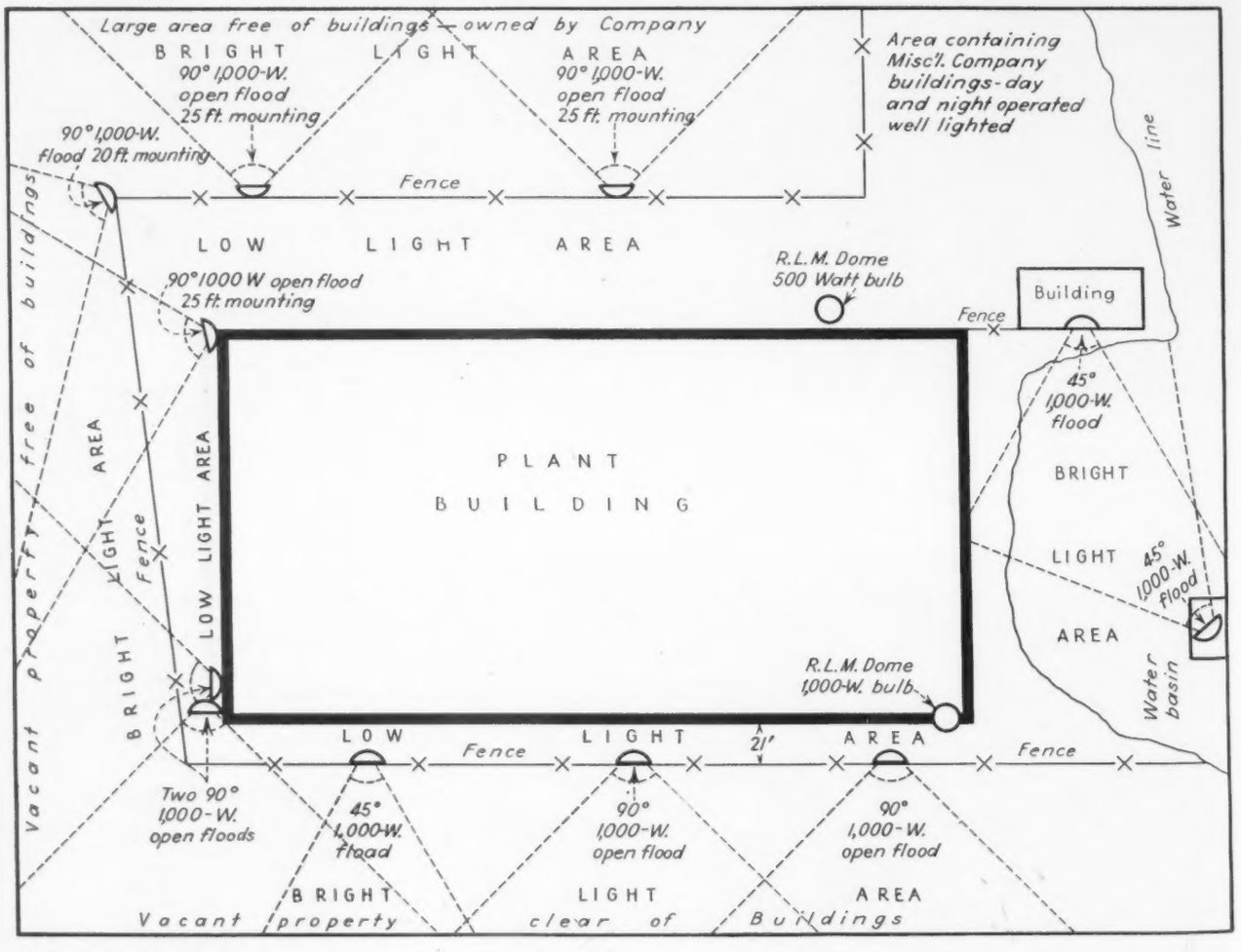
3. An area of low illumination between the fence and the building, getting only such illumination as will seep back from the high-intensity outside area.

The reason for such an arrangement is quite obvious. Any saboteur or organized gang would first have to approach the fence through a zone of very bright light and be plainly visible to the guards in the plant. At the same time, the marauders would be facing the glare from the reflectors, which would partially blind them, so that anything from the fence inward would be seen by them but dimly if at all.

If they get over the fence at all, they still must pass through the zone of







PROTECTIVE lighting layout

There is no unguarded moment in Anaconda's "control" research; the war program and our industry can thus count on the uniform dependability in every Anaconda wire and cable.

KEEN-MINDED technicians peer intently into metallographic microscopes, day in and day out, watching, watching to see that flawless metals go into every Anaconda wire and cable that is delivered to war-vital work.

Unceasing control like this has earned its "keep". For, throughout industry and now in the army and the navy, users have learned they can lean heavily on the dependability of wires and cables bearing the Anaconda trade-mark. And that isn't all.

They have recognized Anaconda research as a source for many product improvements and for many completely new developments . . . such as Type CB* construction that outlasts ordinary shielded paper-lead cable three to one. This research is a boon to our war effort . . . it will be equally valuable to industry with the return of peace.

*CB—Trade-mark Reg. U. S. Pat. Off. 42243

ANACONDA
from mine to consumer

This familiar trade-mark symbolizes the best efforts of modern research and production.

ELECTRICAL WIRES AND CABLES OF COPPER ARE THE LIFE LINES OF OUR NATION

ANACONDA WIRE & CABLE COMPANY

Subsidiary of Anaconda Copper Mining Company

GENERAL OFFICES: 25 Broadway, New York City • CHICAGO OFFICE: 20 North Wacker Drive • Sales Offices in Principal Cities

low-intensity light between fence and building, where the transition from the glaring light to the low light will be quite sudden, so that the low-light zone will seem to them almost like a no-light zone. For the guards in the building, however, who have not been looking directly at the bright lights, there is sufficient light here for them to do their duty promptly and efficiently.

While the accompanying diagram shows a hypothetical case, from the standpoint of arrangement and type of lighting units, it was suggested by a complete, new, protective lighting system installed by a Pacific Coast utility in the last few weeks. It will be seen by this drawing that there are two R.L.M. dome reflector units in addition to the floodlights. These are used at certain points where the low-light areas, because of their width or other reasons, do not receive enough light seeping back from the floods. These units boost the illumination up a bit so that the guards may see any one passing through the area distinctly.

The two detail drawings show typical methods of mounting employed.

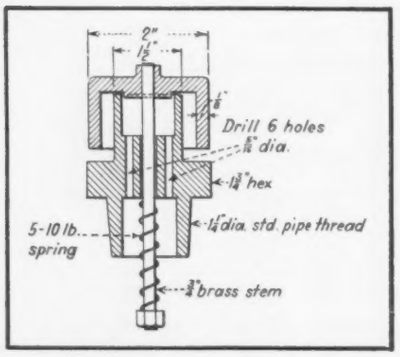
•

Valve Vents Air From Transformers

One utility in the north central area which has been replacing felt cover gaskets on station power transformers with cork has found it necessary to provide a means of relieving internal pressure within the case because of the tightness of the cork seal.

All large transformers returned to the shop for rehabilitation have their felt cover gaskets removed since it was found that "breathing" of the transformers under load tended to cause the felt to absorb excessive moisture, which eventually found its way into the oil. Cork gaskets corrected this condition, but the resulting seal was so tight that excessive pressure developed within the units under load.

The accompanying sketch shows the design of a spring-weighted breather valve now installed on all cork-gasketed station transformers to provide pressure relief. This valve will relieve pressure in excess of 4 lb. per sq.in.



SPRING-WEIGHTED VALVE relieves internal pressure in power transformers

•

Saves 5,000 Kw. by Voltage Increase

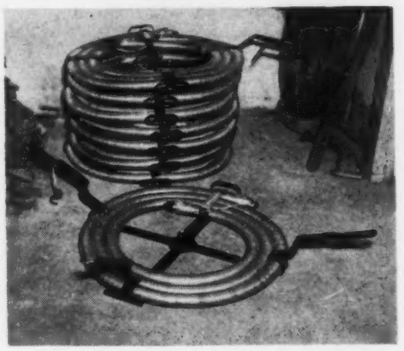
The Montana Power Company, by voltage increase on the Kerr-Anaconda line, will reduce line losses an amount equivalent to 5,000 kw. of additional energy. This line was originally designed and built for 161,000-volt operation, but up to the present time has been operated at 100,000 volts.

To accomplish the change, 90,000 kva. in new auto-transformers were procured before the present restrictions, to step the voltage up to 161,000. Three new 7,500-kva. auto-transformers were also installed for stepping the voltage down at the Missoula tap, midway in the line.

This move had been planned some time ago because of heavy delivery to the Montana-Idaho-Utah line, but now that the change is being accomplished it comes at a time when it represents a wartime economy of considerable magnitude. The only cost entailed is that of the transformers and such revisions in switchyards as were necessary to the change.

•

Strap Iron Fixture Holds Hose Coil

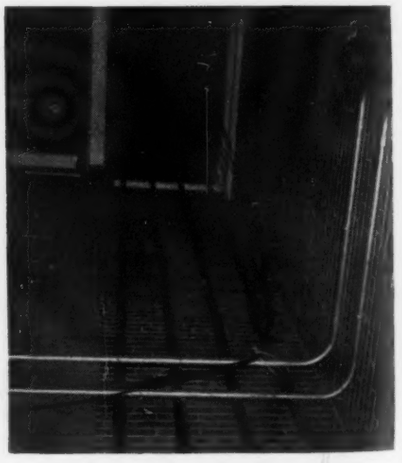


To simplify handling and storing and prevent damage to 25-ft. lengths of metal hose, used by the Kansas City Power & Light Company in the routine handling of transformer oil, John Spencer of the company shops has designed and built several strap iron fixtures of the type shown. The otherwise awkward lengths of hose when coiled in these devices can be carried conveniently in a truck or stacked in the toolroom. Four "legs" of the fixtures, being hinged, can be opened, allowing the hose to be coiled easily. When closed the legs are locked in place, clamping the hose coils firmly.

• • •

Steel Armor Supports Fan Power Cables

Steel-armored, 2,300-volt submarine-type power cable is used as shown at the Cedar Rapids plant of the Iowa Electric Light & Power Company to carry power for induced- and forced-draft fans from the boiler operating floor up along the inside wall of the boiler room to the fan deck atop the boiler. Armored cable was used in this instance to avoid the need for supporting the cable at intermediate points in the run. Steel armoring of the cable itself supports the weight of the entire run. At the upper end the cable armor was belled out and bent back on itself over support members.



WON'T LOOSEN "Drive-Grip" Cross Arm Brace Bolt . . . the serrated teeth grip wood and metal like a meshed gear . . . the washer-nut saves an operation . . . "Speed-Pointed" for fast driving. Cat. No. 5314½—⅝"x 4½."

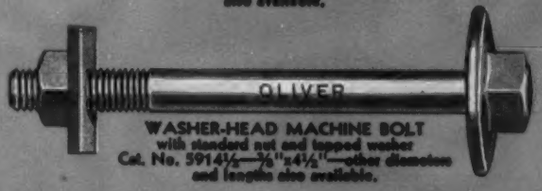
STATIC-PROOF HARDWARE

by Oliver

DOUBLE ARMING BOLT with Combination Washer-Nuts
Cat. No. 6456—⅝"x16"—other diameters and lengths also available.

WASHER-HEAD MACHINE BOLT with Combination Washer-Nut
Cat. No. 6142—⅝"x12"—other diameters and lengths also available.

DRIVE-GRIP LAG SCREW with serrated under-head shoulder
Cat. No. 5714—½"x4"—other diameters and lengths also available.



WASHER-HEAD MACHINE BOLT with standard nut and tapped washer
Cat. No. 5914½—⅜"x4½"—other diameters and lengths also available.

COMBINATION WASHER-NUT
Cat. No. 7933—Tapped for ⅝" Bolt.

SPRING WASHER
Cat. No. 3038—For ⅝" Bolt—other sizes also available. Used under nut and next to wood to take up shrinkage.

THREADED WASHER
Cat. No. 7940—Tapped for ⅝" Bolt.

PAL-NUT
Cat. No. 3033—For ⅝" Bolt—other sizes also available. Used as a lock nut to prevent regular nut from backing off the thread.

Engineered to stay tight, Oliver "Static-Proof" Hardware stops cause of radio interference . . . stops the maintenance caused by loose hardware and the resulting noise complaints. These are extra values you get in Oliver Hardware at no extra cost.

Investigate the exclusive "Drive-Grip" head on Oliver Brace Bolts and Lag Screws . . . the operation-saving, combination washer-nut and washer-head available on other types. SAVE maintenance . . . SAVE trouble everywhere . . . specify Oliver Hardware.

SOLD BY LEADING ELECTRICAL DEALERS EVERYWHERE

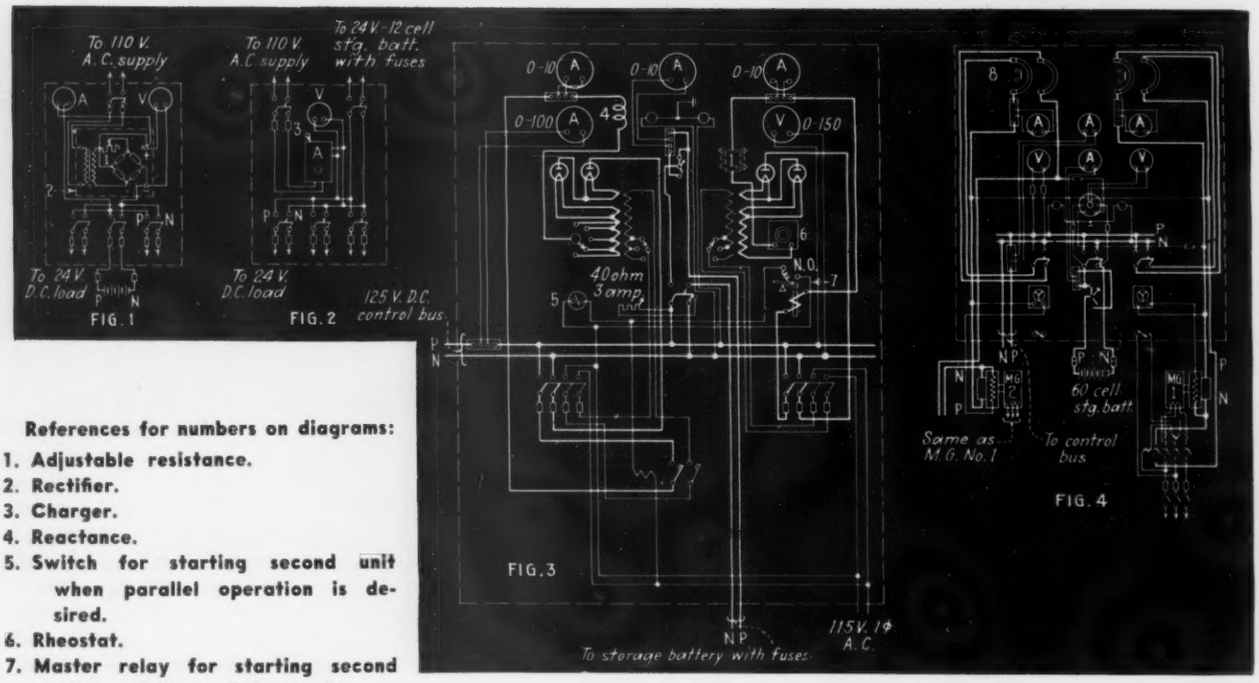
OLIVER IRON AND STEEL Corporation

Makers of Pole Line Hardware Since 1894
PITTSBURGH, PENNSYLVANIA

APPROVED AND ACCEPTED SINCE 1894

HOW TO APPLY

Batteries and Charging Equipment for Power Houses and Substations*



References for numbers on diagrams:

1. Adjustable resistance.
2. Rectifier.
3. Charger.
4. Reactance.
5. Switch for starting second unit when parallel operation is desired.
6. Rheostat.
7. Master relay for starting second unit on failure of first unit.
8. Reverse current circuit breaker low setting.

Notes:

Fig. 1—Rectox trickle charger for 24-volt storage battery

Fig. 2.—Vacuum tube trickle charger for 24-volt storage battery

Fig. 3—Rectigon No. 2 unit or Tungar No. 1 unit charger for 120-volt storage battery. Duplicate units should be used

Fig. 4—Motor-generator trickle charger for 120-volt storage battery in attended substation only

TABLE OF RATINGS

Description of Station	Station Service Load in Amp.	Battery						Charger				Fig. No.
								Nameplate Rating				
		Floating Voltage	8-Hr. Discharge Rate to 1.68 Volts per Cell	Fuse Size in Amp.	1-Hr. Discharge Rate to 1.68 Volts per Cell	No. of Cells	Floating Charge in Amp.	Watts	A.C. Volts — Phase	D.C. Volts	D.C. Amp.	
Small substations for 2-high tension switches	0-2	25.8	4.5	45	16	12	0.2	.....	115-1	30	2.5	1
2 to 6 low-tension switches	0-4	25.8	4.5	45	16	12	0.2	.....	115-1	30	5	2
Small 60-kv. substations	0.4	25.8	4.5	45	16	12	0.2	.....	115-1	30	5	2
Spring-operated 60-kv. switches a.c.type	1-5	130	15	150	70+	60	0.2-0.4	.....	115-1	150	6	3
MK or solenoid-operated low-tension switches	1-6	130	15	150	70+	60	0.2-0.4	1,000	220-3	140	....	4
Medium-size substations and small power houses	1-5	130	15	150	75+	60	0.2-0.4	.....	115-1	150	6	3
2 to 6 high-tension switches 4 to 10 low-tension switches	1-6	130	25	250	100+	60	0.2-0.4	1,000	220-3	140	....	4
Large 60-kv. or medium-size 100-kv. substations and most power houses	5-12	130	30	300	125+	60	0.25-0.6	3,000	220-3	140	....	4
Large stations	12-20	130	50	500	200+	60	0.5-1.0	5,000	220-3	140	....	4

*From a book of standards of a Western utility organization.

Right off the *Top*, boys *and plenty* *Dirty!*

Getting stores from the top of the heap is always a dirty job . . . for dust settles on horizontal surfaces everywhere whether these surfaces are boxes in storage or parts inside motor control in any factory.

Cutler-Hammer *Vertical* Contacts are the mark of better Motor Control, another extra dividend on Cutler-Hammer's unequalled specialized experience and decades of leadership.

More and more engineers are recognizing the hazard of dust in Motor Control. That fact is proven by another fact . . . that more and more engineers responsible for non-stop victory production are *insisting* on Cutler-Hammer Motor Control. It's the Motor Control with the famous *dust safe* VERTICAL contacts that can't collect dust, that *stay* clean to last longer and work better. Dirty electrical contacts can sabotage production just as surely as any "underground" organization, and a great deal more insidiously. Play safe. Specify Cutler-Hammer Motor Control and *see the difference*. CUTLER-HAMMER, Inc., 1285 St. Paul Avenue, Milwaukee, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto.

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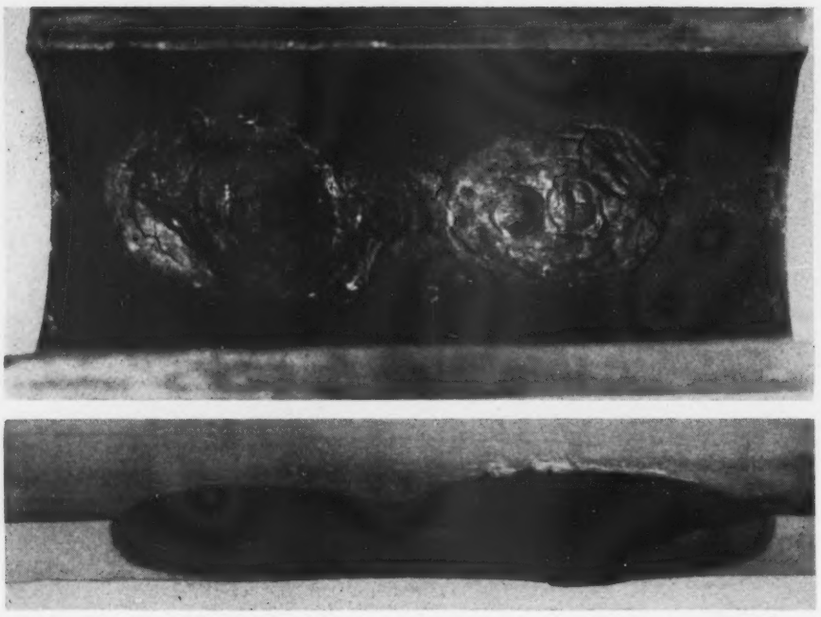
CUTLER-HAMMER
MOTOR CONTROL
C-H

Dust Safe
VERTICAL
Contacts

1892-1942 50th ANNIVERSARY



EXAMPLES of pitting types of corrosion: deep pits may be up to a foot long; they occur erratically in a tube, none in neighboring tubes; there may be several in close proximity in a single tube

Instances of pitting such as shown in the accompanying illustration have been found in tube ends, in the lower end of dry ash hoppers, in areas where the gas temperatures are down to 1,500 deg. F. and where the tubes are vertical and the flow is high. They occur in water wall tubes and in boiler tubes, and are more than usually troublesome because they cannot be foreseen or discovered upon inspection, and therefore when they fail the resulting outage is unscheduled.

A running argument is in process among chemists as to the cause of such corrosion, whether the pH value is too high or too low, and whether the concentration in the boiler should be more or less. Some argue that a high caustic content in the water induces this corrosion, and yet a number of units of exceptionally clean interior with no corrosion at all are in operation with pH above 12. Others argue that high heat input is the cause. This does not account for these corrosion pits in water walls in cold zones.

More Steam—How?

4. Boiler Tube Corrosions*

*By ALFRED IDDLES
Application Engineer
Babcock & Wilcox Company

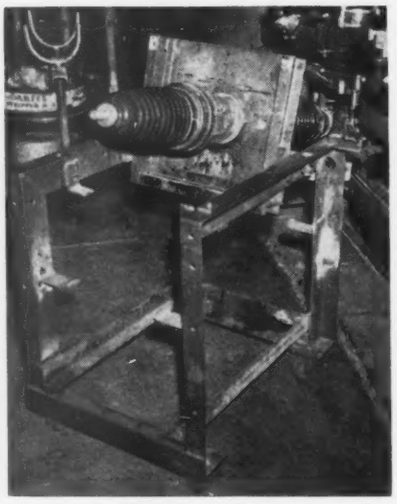
Many published reports of tube corrosion in high-pressure boilers have been cases of tubes that were nearly horizontal; the rate of heat input in comparison with circulation produced a layer of steam along the top side of the tube. This results in a characteristic oxidation which builds up a layer of sponge-like iron oxide. This acts as an insulator to decrease the contact between water and tube metal, so that there results an increasing rate of deterioration and failure in a relatively short time. This difficulty can be prevented by proper circulation or proper control of heat input. There has been much argument about the desirable water conditions to have under such circumstances. I doubt if there is any conclusive evidence that these types of failures can be prevented by water conditioning. The phenomenon is rather common and apparently quite characteristic, and to prevent it one must either have a higher velocity of water or less heat input.

There is, however, another kind of corrosion which has shown up particularly on the 900- and 1,250-lb. boilers, which is quite different. There is a fair number of such units now in trouble.

* This series began in the May 16, 1942 issue of "Electrical World"; adapted from author's talk "What the Operator Wants to Know" to Steam Power Division, A.S.M.E. Metropolitan Section, March 25, 1942.

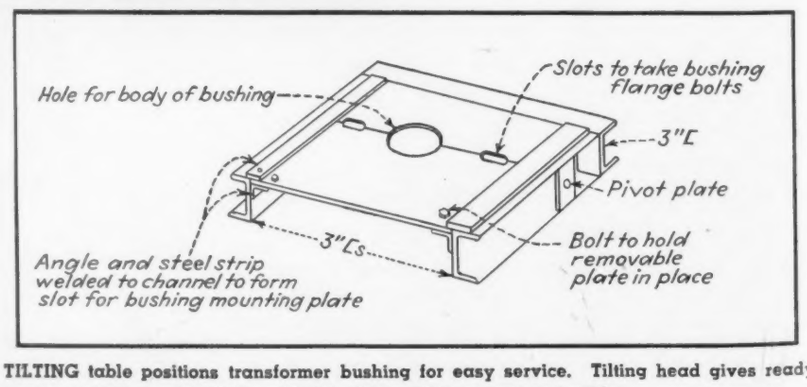
• • •

Tilting Table for Bushing Maintenance



For convenience in the maintenance of transformer bushings an ingenious tilting table is used at the shops of the Oklahoma Gas & Electric Company which positions the bushing for easy access to its lower part during servicing. Accompanying illustrations show the elements of the table.

To mount a bushing, its flange is bolted between halves of a removable steel plate that slides into the tilting head of the table and is pinned in place. The bushing can then be safely tipped to a horizontal position and allowed to rest on a wooden stop placed between cleats on the supporting frame of the table.

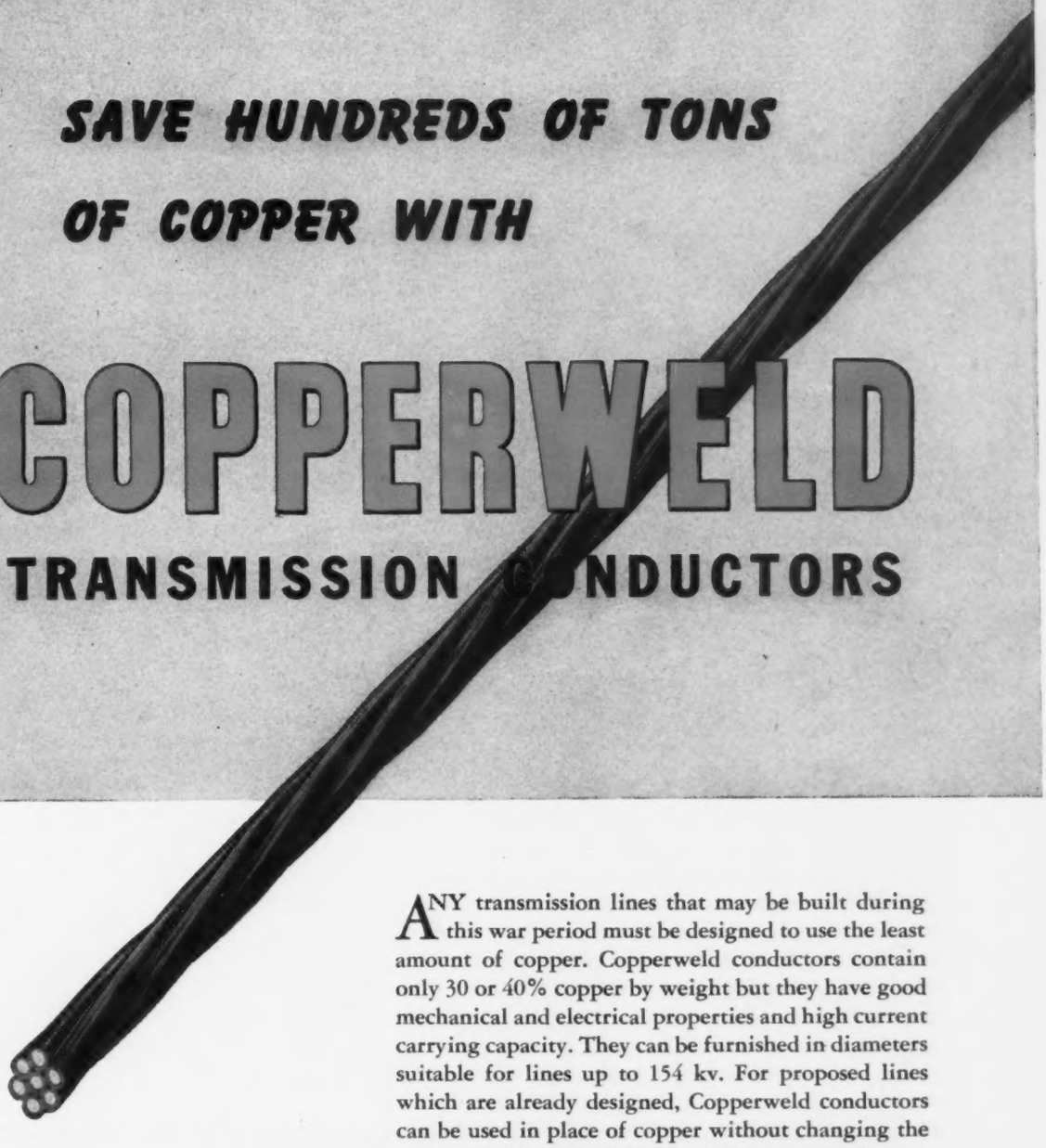

Hole for body of bushing
Slots to take bushing flange bolts
3"[
Pivot plate
3"[s
Bolt to hold removable plate in place
Angle and steel strip welded to channel to form slot for bushing mounting plate

TILTING table positions transformer bushing for easy service. Tilting head gives ready access to bottom of bushing. Sketch shows tilting portion of table

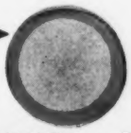
SAVE HUNDREDS OF TONS OF COPPER WITH

COPPERWELD

TRANSMISSION CONDUCTORS



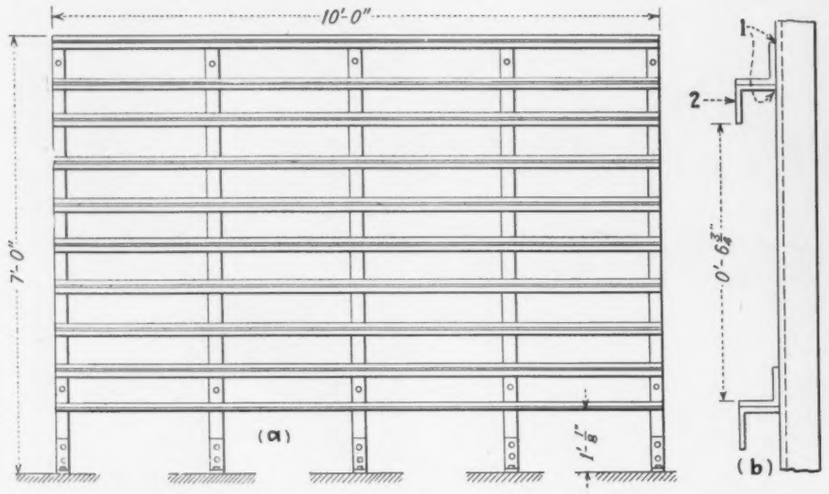
ANY transmission lines that may be built during this war period must be designed to use the least amount of copper. Copperweld conductors contain only 30 or 40% copper by weight but they have good mechanical and electrical properties and high current carrying capacity. They can be furnished in diameters suitable for lines up to 154 kv. For proposed lines which are already designed, Copperweld conductors can be used in place of copper without changing the mechanical design of the line. Resistances and reactances are of the same order as copper conductors having an equivalent amount of copper. Copperweld conductors have good current carrying capacity and can be subjected to high temperatures without loss of strength or annealing. Their diameter is large in proportion to the copper content and this is very helpful in reducing corona loss.

COPPERWELD → 
REQUIRES ONLY 30% (OR 40%) COPPER

USE COPPER WISELY · DO NOT WASTE

COPPER WIRE →
REQUIRES 100% COPPER

COPPERWELD STEEL COMPANY
GLASSPORT, PA.



DETAILS of (a) meter storage rack unit and (b) meter supporting angle to channel frame. Upright members are 7-ft. 2-in. x 1 x 3/16-in., 2.6-lb steel channels. Cross-members for supporting meters are 10-ft. 1-in. x 1 x ⅛-in. steel angles. References for numbers: (1) angles to be welded to each channel; (2) this angle to be tack-welded to upper angle every 12 in.

METER storage racks—seven-unit sections provide space for 1,000 meters

Simple Construction for Meter Rack

By E. E. DOUDNA
Superintendent of Meters
Electric Power Board of Chattanooga

At the time the type CS detachable meters were introduced little or no provision had been made for their storage. Utilities had devised various methods of storing. Then the manufacturer supplied a hanging lug. However, in order to use this lug certain inconveniences were encountered in that it was necessary to use a long mounting stud which protruded from the mounting surface, which introduced certain hazards to the clothing and the body of the meterman.

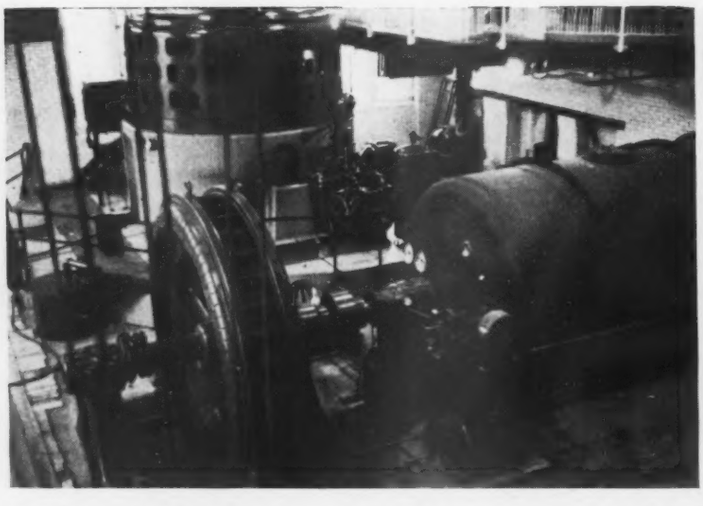
The Electric Power Board of Chattanooga, starting from scratch, found itself confronted with the necessity of providing storage space for its stock meters, which numbered several thousand. After considering methods of mounting and supporting, the idea was conceived to mount angle iron upon upright supports, one angle iron forming the top catch, while the lower angle iron would act as a support for the meter. The natural weight of the meters holds them in position.

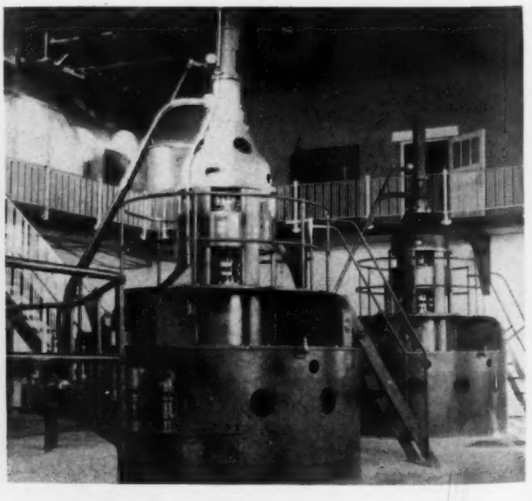
A sample mounting rack was first made up and tried. It proved so successful that sufficient storage space was provided for approximately 1,000 meters. A rack 10 ft. long by 7 ft. high and having nine storage racks will accommodate 144 meters. The accompanying illustrations indicate the ease with which this rack can be constructed and the many advantages it has. This rack has been in service for approximately 30 months and has proved satisfactory in every respect.

•

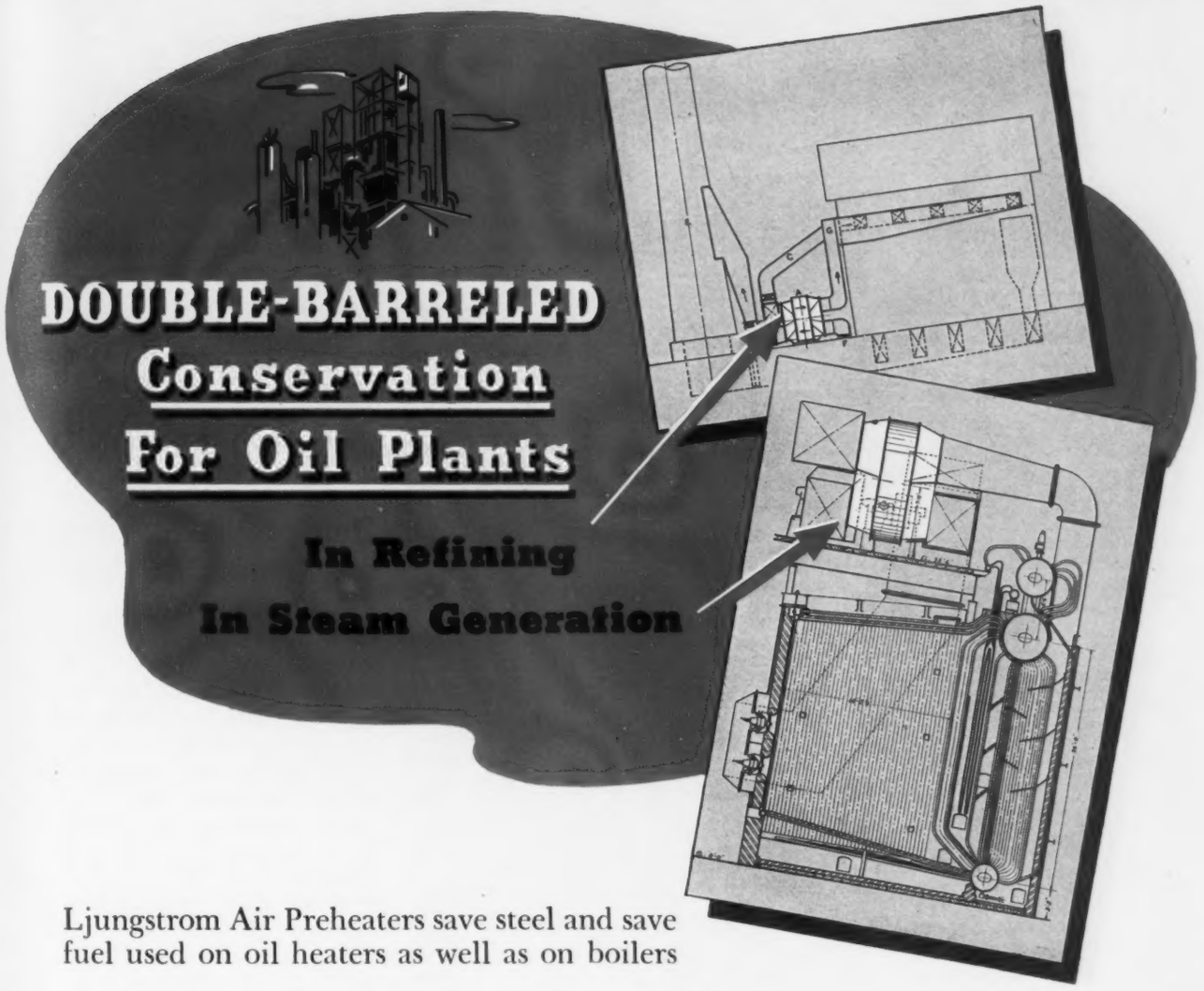
Space Economy of Vertical Hydro Units

In the Ellsworth station of the Bangor Hydro-Electric Company two 2,000 kw. G.E.-S. Morgan Smith hydro-electric units of the vertical automatic adjustable Kaplan type replaced two former horizontal units of about 1,000 kw. capacity each in





OLD HORIZONTAL generating unit with a later vertical machine in the background (left). Two 2,000-kva. vertical machines giving over twice the output of horizontal units formerly located here in less than 50 percent of the floor space (right)



Ljungstrom Air Preheaters save steel and save fuel used on oil heaters as well as on boilers

On oil-plant steam generating units, Ljungstrom Air Preheaters are fast becoming standard. Recent orders for steam generating plants of *three different oil companies* . . . being supplied by *three different boiler manufacturers* . . . all call for Ljungstroms.

There's a double-barreled reason for this preference: (1) The increasing need for fuel conservation, even where it is freely available at low cost, raises the importance of improved combustion and heat recovery obtained with preheated air. (2) The Ljungstrom Air Preheater gives more heat recovery per pound of steel. Frequently a Ljungstrom weighs only ½ to ⅓ as much as alternate types, with additional savings in the supporting structure.

On cracking still furnaces, too, preheated air does double duty for conservation: (1) It lowers fuel consumption, (2) It permits a significant reduction in the alloy steel convection tube banks. Exit gas temperatures from the furnace as high as 1400 deg. F. are practical with "high-temperature" Ljungstroms, heating combustion air to 1000 deg. F. or more. This means maximum heat recovery per pound of oil-tube steel.

A new illustrated booklet, "Another Kind Of Air Power With A Wartime Job To Do", tells how the Ljungstrom is being used in wartime service. Case history information of savings resulting from use of the Ljungstrom makes it worthwhile reading. It's yours for the asking. Write for a copy today.

THE

AIR PREHEATER

CORPORATION

Executive Offices: 60 East 42nd Street, New York, N. Y. • Plant: Wellsville, New York

ARTERIES for PRODUCTION'S "LIFEBLOOD"

made to order—fast!

GRINNELL provides the means for converting a *pile* of pipe into a piping *system* . . . a vital artery to furnish Power . . . Fire Protection . . . Heat . . . Fuel . . . Air . . . Water . . . Humidification in a plant, a ship, a tank or a plane.

Taking the OFFENSIVE against delays in production, Grinnell has stepped up its nation-wide facilities to handle all requirements "whenever piping is involved"—*faster*. Included are pipe prefabrication for power and process lines, automatic sprinkler fire protection, cast and malleable iron fittings, pipe hangers for every condition, welding fittings, heating specialties and humidification systems. Grinnell Co., Inc., Executive Offices, Providence, R. I. Branch offices in principal cities.

Don't let delays occur—call upon GRINNELL

WHENEVER **PIPING** IS INVOLVED

Grinnell Company, Inc. • *Grinnell Company of the Pacific* • *Grinnell Company of Canada, Ltd.*
General Fire Extinguisher Company • *American Moistening Company*
Columbia Malleable Castings Corporation • *The Ontario Malleable Iron Company, Ltd.*

a modernization program. In water economy these new units are at least 10 percent more efficient than the old units as an average over the full operating range, and they also occupy less than half the floor space and develop over twice the power capacity of their predecessors.

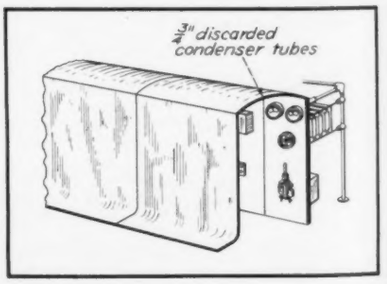
All the generators in this plant, which now total 8,900 kw. in four units, deliver energy at 2,300 volts. The space economy of the new units was of great advantage in the reconstruction of the station, and the increase in efficiency proved of much importance during a recent period of sub-normal river flow.

•

Home-Made Blackout for Generating Plant

Employees of the Patchogue Electric Light Company knew that plans were under way to operate the station in times of emergency, and to avoid the expenditure of substantial funds they scampered around to provide their own blackout materials from odds and ends around the plant.

First problem tackled by Clarence Hyzer and his men was the main switchboard. Some discarded ¾-in. condenser tubes were found in the storeroom and these were cut into 4-ft. lengths and clamped to the pipe work at the back of the main switchboard. Then a wire was stretched



STATION OPERATORS make their own "light lock" in front of main switchboard at generating plant by utilizing discarded condenser tubes and 39 cents per yard material purchased in local stores

along the outer edges of the condenser tubes.

Looking around town, the operators were able to get hold of a quantity of the material used in lining men's suits and secured it at a cost of 39 cents a yard. This was stretched from the top of the switchboard out over the condenser tubes and then

down to the floor, making a light barrier about 4 ft. in front of the switchboard and running its entire length. Additional lining material was secured to cover up each end of the tunnel.

This plan now provides a convenient area from which the entire switchboard may be operated during a blackout even though all of the customary lamps on the board are turned on. Until the time when the "light lock" along the entire switchboard is needed, it is rolled up, much after the fashion of an old stage curtain, rolled back over the condenser tubes and rests until needed on top of the switchboard.

•

Where to Get New Watch Engineers

In common with most other utilities, two companies located in New Jersey are seeking potential candidates to replace general station employees who have been called into the armed services.

The companies are overlooking no bets in their normal sources of supply for assistant engineers or for cadet engineers. Although most young men are subject to military service, there is always a portion of these who are not accepted for service. These utilities find that a man who may not pass muster for highly skilled military tasks is good material for a training course which through a period of years leads to the position of watch engineer.

While these sources of supply are limited, the companies are looking into new sources and with very good results. The thing to do, say these companies, is to look around for men, 40 and over, with family responsibilities who like to "fool around" with gadgets and machines.

Filling station men, for example, may be too old for active service or may not be 100 percent perfect physically, but if they have always liked to tinker around modern automobiles, these utilities will give such men every opportunity to learn about generating stations.

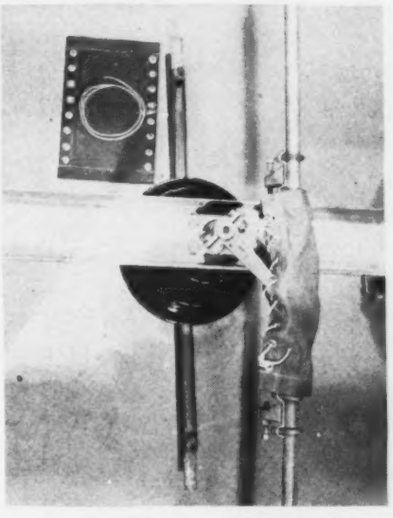
Another new source of manpower which is working out well is the man who may be a bookkeeper or in some profession, yet he spends every free hour with his own private mechanical and electrical gadgets at home. These companies found that when this type first sees the interior of a modern generating station he feels that it is Heaven on earth and he generally develops into a most apt student of all of the station's ramifications.

Another company has found that some of the construction companies and the tree-trimming outfits are releasing men, some of whom are good candidates for overhead distribution gangs.

In each of the companies the new men are instructed on the job by foremen and superintendents. Classes have not been undertaken yet (1) because so few men have been found and accepted to date and (2) because, so far, only one man at a time is taken through the "break-in" process. Due to the complexities of utility operating work, the one-man-at-a-time program reduces accident hazard and results in tailor-made training.

•

Boots Keep Ice Off Switch Mechanism



A simple means of protecting air-break sectionalizing switches against severe sleet and ice conditions, which often renders them inoperative at the very time they are needed the most, is to equip knuckle joints with heavy duck hoods, fabricated in rectangular shape 12x18 in. Metallic eyelets are spaced 2 in. apart along each edge of the 18 in. dimension and laced in place with a weatherproofed cord.

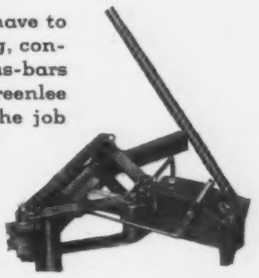
From paper "War on Waste," by Lawton M. Limpus, Oklahoma Gas and Electric Company, presented before Missouri Valley Electric Association.

GET *Extra* MAN POWER with GREENLEE BENDERS

- EASIER AND FASTER
- ONLY ONE MAN TO OPERATE
- LIGHT, PORTABLE, EASY TO SET UP
- POWER TO BEND 1¼" TO 4½" PIPE
- SAVE COST OF MANUFACTURED BENDS
- MAKE SMOOTH, EVEN BENDS

As good man power becomes scarcer in the present emergency, increase the efficiency of your men by turning to a better use of tools. Let Greenlee Benders help you speed up construction by making the work easier and faster for the man on the job. Greenlee Benders are daily saving contractors on defense jobs from 15 to 75% in time and labor costs.

There's a Greenlee Bender For Every Job



Whatever you have to bend . . . tubing, conduit, pipe or bus-bars . . . there is a Greenlee Bender to do the job easier and faster. Small hand benders will bend copper tubing from ⅜ to 1⅛ inches and steel, copper, brass, and aluminum tubing from ¼ to ¾ inches. Powerful Greenlee Hydraulic Benders are available for bending 1¼ to 2-inch thin-wall conduit, 1¼ to 4½-inch rigid conduit and pipe, and for bus-bar up to 4 inches wide and ¾ inches thick.

These benders are all readily portable, easy for one man to operate, make smooth, even bends without distortion, and eliminate the need for many costly fittings and manufactured bends. Find out how Greenlee Benders can save vital hours on your defense jobs . . . write for Bender Booklet S-116.

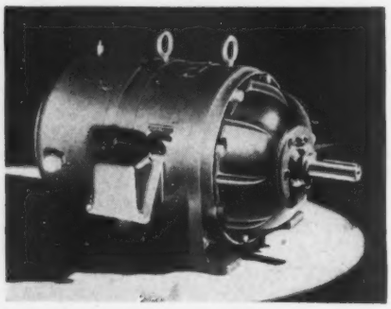
Greenlee TOOL CO.

1807 Columbia Avenue, Rockford, Illinois

NEW EQUIPMENT

Motors

New line of induction motors has been developed for use under magnesium dust conditions. These motors are totally in-



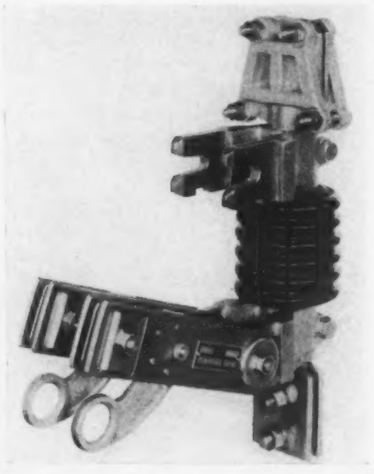
Polyphase induction motors; ratings 1 to 20 hp., NEMA frames 203 to 326, labeled as suitable for Class II, Group E locations. **General Electric Co.**, Schenectady, N. Y.

closed, with a non-ventilated construction in the smaller ratings and a fan-cooled construction above 2 hp. Non-sparking bronze external fans are included.

•

Switch

Indoor type disconnecting switch is designed to be clamped directly to the bus-bar and requires no additional mounting facilities. Hook-stick ring and position lock between the hinge and contact eliminate,



Type "WC-14" bus bar tap switch; ratings up to 15 kv. and 2,000 amp. (7.5 kv., 2,000 amp. illustrated). **Delta-Star Electric Co.**, 2400 Fulton St., Chicago, Ill.

it is stated, the usual overhang for hook and lock. High-pressure silvered contacts are at both hinge and contact ends. The switch can be arranged also for mounting on tubular bus, either round or square.

•

Welder

"Ergolyte 250 F Welder." **Ergolyte Manufacturing Co.**, Lawrence Street at Erie Avenue, Philadelphia, Pa.

Heavy-duty air-cooled arc welder contains a built-in cooling system which reduces thermal stress on the machine. Capable of handling an electrode from $\frac{1}{16}$ to $\frac{3}{16}$ in., this model has 24 heat steps, input voltage of 230 volts and current range from 15 to 250 amp.

•

Utility Lantern

General utility lantern has all-plastic housing. Features adjustable focal length

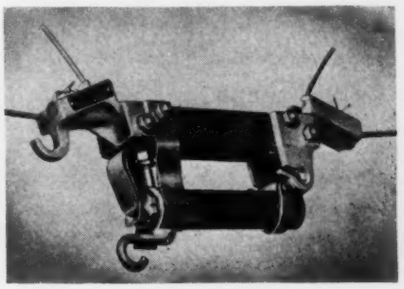
"FocOlite Lantern," **Focal Co.**, Downey, Calif.; Tenite housing by **Modern Plastic Co.**, 4641 Pacific Blvd., Los Angeles, Calif.

and a small light bulb on extension cord that may be used to illuminate objects not made visible by larger beam. Light in weight, non-tarnishing and rust-proof, this lantern is said to be very durable.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Cutout

Designed for use on overhead lines or feeder circuits, where it is not desirable to interrupt the service, and without re-



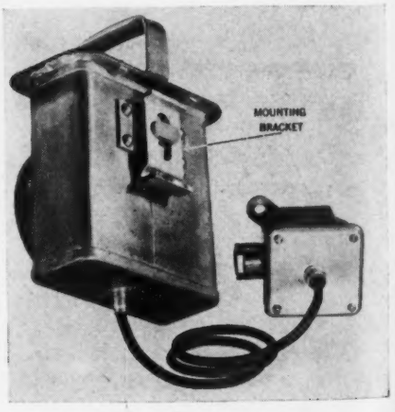
Type "KOT-S" cutout. **Railway & Industrial Engineering Co.**, Greensburg, Pa.

moving the tension on the wire, cutout may be installed by being clamped direct before the line is cut. When installed the unit is said to carry a tensile strain of over 2,000 lb. on wire sizes from No. 6 to 4/0. Any universal link may be used.

•

Emergency Light

Made of stamped steel and having a shock-proof mounting bracket, new emergency light is connected to a gravity type relay which automatically places the lantern in circuit with two No. 6 dry cells when normal a.c. or d.c. supply fails. Lantern is suitable for industrial plants and may be unmounted for use by watchman.



Type "J-R-1" hand lantern; drawing No. 9-S-5293-L by U. S. Navy. **A. & G. Manufacturing Co.**, 149 Wooster St., New York, N. Y.

"KEEP 'EM FLYING!"

You may have heard that Hubbard and Company has gone "all out" for the duration. You may also have formed the opinion that such being the case, Hubbard Pole Line Hardware might have become one of those war-time "hard to get" commodities.

You may be sure that we have turned over to war production, every facility that the U. S. Armed Forces have needed, and are working day and night to "Keep 'em flying." Otherwise, we would not have earned the All-Navy "E" for production, recently awarded to us.

But you may also rest assured that we are doing everything in our power to take care of our regular customers, as witness the huge stocks pictured above. In peace times our operation runs five eight-hour shifts per week. In these war times we are running twenty-one eight-hour shifts per week. Yes! we are working hard to "Keep 'em flying" but we likewise pledge every effort to you, our customers, to keep the freight cars rolling to meet your needs.

HUBBARD AND COMPANY

PITTSBURGH . . . CHICAGO OAKLAND . . . CALIFORNIA

"HANG THE LOAD ON HUBBARD HARDWARE"

FEDERAL
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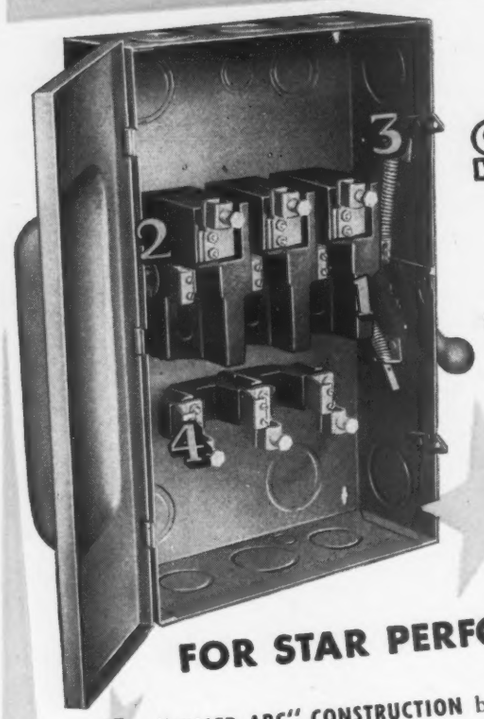

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SAFETY SWITCHES FOR INDUSTRY

star features

FOR STAR PERFORMANCE

1 **"SEALED ARC" CONSTRUCTION** barricades switching arms behind porcelain to minimize effects of arcing, assure long life for contacts.

2 **VERTICAL-RIBBED ARCING CHUTES,** lining interior chamber of switching block, break up and snuff the arc. An exclusive Federal feature.

3 **STURDY QUICK-MAKE, QUICK-BREAK** spring mechanism.

4 **PATENTED "VISE-CLAMPS"** grip fuses tighter than old-fashioned spring tension, prevent heating.

These are but four of the many features that make Federal "Sealed Arc" Safety Switches favorites for every industrial application. Use them for trouble-free operation on your essential circuits.

For Complete Safety Switch Data

write for Bulletin 21-40-S. Contains all essential facts on Types A, C and D Federal "Sealed Arc" Safety Switches.

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54 PARIS STREET, NEWARK, N. J.

Follow the Federal Line

PANELBOARDS · SWITCHBOARDS · SAFETY SWITCHES · CIRCUIT BREAKERS

TECHNICAL LITERATURE

RUBBER—Suggestions on conservation of rubber products are given in a 48-page illustrated book covering proper care—from initial design through inventory and storage to use, maintenance, inspection and repair. The book, "First Aid to Industry in Conserving Rubber," is available from the United States Rubber Company, Rockefeller Center, New York, N. Y.

BIBLIOGRAPHY—Second bibliography of technical literature, "Bibliography on Circuit-Interrupting Devices, 1928–1940," lists 850 titles under subject headings—Circuit breakers (air, oil, water, rapid reclosing, recovery voltages, general and miscellaneous), enclosed switchgear, air switches, busbars, and fuse and fuse protection. Like the relay bibliography, it is sponsored by the A.I.E.E. committee on protective devices, and is available from A.I.E.E. headquarters, 33 West 39th St., New York, N. Y.; price 80 cents per copy to non-members.

ARC WELDING ELECTRODES—New iron and steel arc welding electrode specifications have modifications including the introduction of yield strengths for the classes E60 and E70 and the addition of all the mechanical data for classes E80, E90, and E100. Copies of the standards A233-42T may be obtained, at 25 cents each, from American Society for Testing Materials, 260 South Broad St., Philadelphia, Pa., or American Welding Society, 33 West 39th St., New York, N. Y.

AIR CIRCUIT BREAKERS—For protection of resistance-welding machines operating on circuits up to 600 volts a.c., maximum loading curves reference tables, and instructions on selection of several types of circuit breakers are contained in publication GEA-2997B obtainable from General Electric Co., Schenectady, N. Y.

CANADIAN STANDARDS — Two revised standards have been issued as Approvals Specifications of the Canadian Electrical Code. Titles: "Industrial Control Equipment for Use in Ordinary (Non-hazardous) Locations—Second edition" and "Receptacles, Plugs and Similar Wiring Devices—Second Edition". Copies may be obtained at 50 cents each from the Canadian Engineering Standards Association, National Research Bldg., Ottawa, Ontario.

WELDING—Engineering aspects of welding are covered in a paper prepared by H. Malcolm Priest, engineer, Railroad Research Bureau, U. S. Steel Corporation Subsidiaries. A copy of the 24-page booklet may be obtained from the American Welding Society, 33 West 39th St., New York, N. Y.; price 25 cents.

INFRA-RED—"New Facts About Infra-Red", contains latest data on use of infra-red to make industrial finishes. Questions and answers in infra-red methods are included. Copies may be secured from Ault & Wiborg Corp., 75 Varick St., New York, N. Y.

LIGHTING—Fundamental conceptions of lighting and discussions with sketches on applications in the various branches of the aircraft industry are contained in a bulletin, "Lighting for the Aircraft Industry," made available to industrial executives by Holophane Co., Inc., 342 Madison Ave., New York, N. Y. In addition to illustrations of the company's products, there are numerous charts designed to help in the calculation of illumination at a point.

INDUCTION HEATING — Monthly data sheets on induction heating are being issued by Induction Heating Corp., 389 Lafayette St., New York, N. Y. Sheet No. 1 treats of elemental theory.

REPORT—In Engineering Report No. 48 improved methods and augmented data are presented for estimating low-frequency magnetic shielding in telephone cables of lengths such that effects of conductor-sheath capacitance may be ignored. It includes graphical charts to facilitate computations. Publication J-4, "Low-Frequency Shielding in Telephone Cables," may be obtained from Edison Electric Institute, 420 Lexington Ave., New York, N. Y.; price $2 to non-members in U.S.A.

BABBITT AND SOLDER METALS—Properties of alternates and substitutes are given in appendices EA-23 and EA-32 to ASTM specification B23-26 on white metal bearing alloys and specification B32-40T on soft solder metal. The appendices may be obtained from ASTM headquarters, 260 South Broad St., Philadelphia, Pa.

PLASTICS—Technical data—thermal, mechanical, electrical, chemical—on new Colonial "V" plastics is given on a series of mimeographed sheets issued by Colonial Alloys Co., Chemicals Div., Colonial Philadelphia Bldg., Philadelphia, Pa.

MAINTENANCE—The metallizing process—spraying metal on machine parts as a maintenance procedure—and equipment for its application are described in the 16-page Bulletin 42A, published by Metallizing Engineering Co., Inc., Long Island City, N. Y.

GLOVES — Information, including types available, on its electrician's gloves made by the Anode process of liquid latex, is presented in a four-page Catalog Section 9036, available on request to The B. F. Goodrich Co., Akron, Ohio.

LIVE LINES—A series of bulletins outlines and illustrates methods of handling single conductors, instructions for removing tie wires without loops, how to handle single ridge pin insulators and contains wire size data for selecting tools and clamps. These bulletins are part of Catalog 941 which may be obtained from Bodendieck Tool Co., 325 East Main St., Taylorville, Ill.

RESISTORS—Essential data on over 122 sizes in 18 standard types of fixed and variable resistors is given on a wall chart distributed by the International Resistance Co., Philadelphia, Pa. Resistors are listed numerically according to wattage rating—$\frac{1}{2}$ to 200 watts.

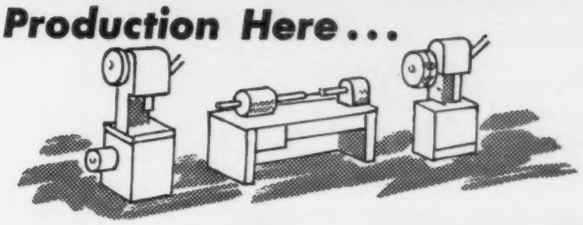
SPRINGS — Considerations in the design and manufacture of instrument springs, together with certain operational information, is included in "Instrument Springs", published by All-Weather Springs, 72 Washington St., New York, N. Y.

COMBUSTION CONTROL—Electrically actuated combustion control regulators and systems are fully described in Bulletin 15 of Brooke Engineering Co., 4517 Wayne Ave., Philadelphia, Pa. Suggestions regarding control applications are included in the 42-page booklet.

BALL BEARINGS — Fundamental rules of design for ball bearing mounting, proportions and finish of bearing seats and bores, recommended shoulders, locating and clamping methods, use of split housings, and several other subjects with numerous sketches are presented in a booklet "Details of Shaft and Housing Design Relative to the Application of Ball Bearings." Copy of the 24-page publication may be obtained from New Departure Division General Motors Corp., Bristol, Conn.

FIRE HERE

CAN KILL *Production Here...*



and MEN *Here...*

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Cardox becomes the logical means, because it uses low temperature liquid CO_2—"knocks out" fire *immediately*—leaves no damage by the extinguishing medium—limits damage to actual flame areas. Cardox Systems are *engineered* to fire conditions for *engineered performance*—cover large areas—offer high reserve capacity.

Good executive judgment will recognize the urgent need for action—when serious hazards are getting by, from day to day, *without* complete coverage. Take the first step now to "knock out" any possible fire on your property by a timed, mass discharge of Cardox. Just write for Bulletin 572.

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NON-DAMAGING FIRE EXTINGUISHING SYSTEMS

NEWS ABOUT PEOPLE

W. C. Richardson Promoted by Indianapolis Power

William C. Richardson, who has a 30-year record in the electric service of Indianapolis, has been honored by the board of directors of Indianapolis Power & Light Co. with advancement

to the first vice-presidency of the company.

He was one of the incorporators of the present company in 1926 and has served as treasurer and a director ever since incorporation. He also has been assistant secretary since 1930 and one of the company's vice-presidents for more than six years.

Mr. Richardson's career in the public utility field started in 1912 when he became affiliated with a predecessor company of Indianapolis Power & Light.

•

► W. P. Dobson, chief testing engineer of the Hydro-Electric Power Commission of Ontario, was elected president of the Dominion Council of Professional Engineers at the recent annual meeting in St. John, N. B. Since 1914, when he joined the commission, Mr. Dobson has devoted himself largely to research and standardization. He is a past-president of the Professional Engineers of Ontario, a former vice-president of the American Institute of Electrical Engineers, and is a member of the executive committee of the Canadian Engineering Standards Association.

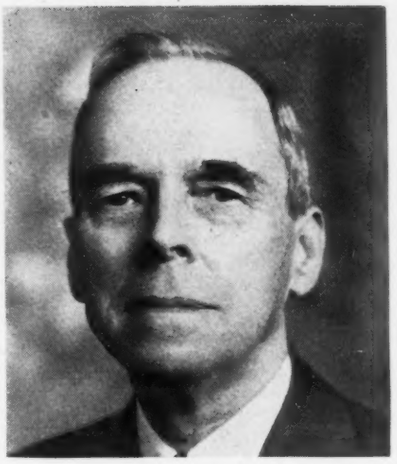
•

Howe Made Meter Division Head; Vaughen Retires

Two appointments in the meter division of General Electric's central station department have been announced by H. V. Erben, manager of the department. William F. Howe has been appointed manager of the meter division, succeeding Frank G. Vaughen, who retired July 1. Richard Cutts, Jr. has been named assistant to Mr. Howe. Both Mr. Howe and Mr. Cutts will have their offices at the G. E. West Lynn (Mass.) Works.

Mr. Howe, a native of Leominster, Mass., was graduated from Worcester Polytechnic Institute in 1900 with a B.S. degree in electrical engineering. In July of that year he became a student engineer on "Test" at General Electric's West Lynn Works and in 1901 was transferred to the company's meter and switchboard department, Schenectady, to assume the duties of meter specialist. In 1909, Mr. Howe became assistant to Mr. Vaughen, then sales manager of the meter department. Fourteen years later he was promoted to general assistant in the meter division of the central station department at Schenectady, later becoming assistant manager.

Mr. Cutts entered the employ of General Electric as an engineering assistant at the West Lynn Works immediately after graduation from the Massachusetts Institute of Technology in electrical engineering. In 1937 he became meter specialist of the New England district, with headquarters at Boston, and early this year was transferred to the meter division of the G.E. central station department, West



W. F. Howe

Lynn. Mr. Cutts is a member of the American Institute of Electrical Engineers and of the New England Association of Meter Engineers.

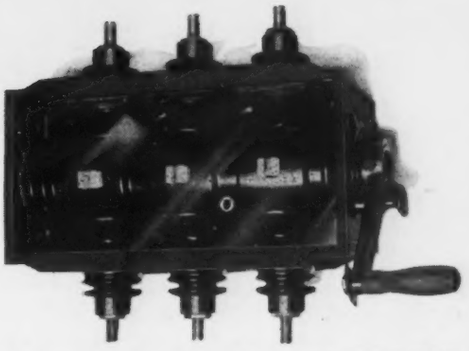
Mr. Vaughen, manager of the meter division since 1923, and widely known in the electrical industry, retired after more than 50 years with the company. He will continue to serve the division as a consultant with headquarters in Schenectady. Famous as "dean of the

F. G. Vaughen

ANOTHER

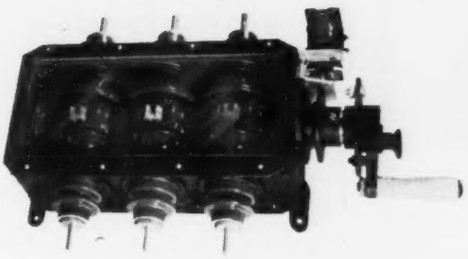
Elpeco CONTRIBUTION for BETTER SWITCHING

ROTA SAFETY SWITCH



This is the original, standard ROTA Safety Switch. Open position.

BULLETIN 6300 IMMEDIATELY AVAILABLE



ADDITIONAL

Rota Safety Switch equipped with electrical interlock to prevent opening of Rota Switch until main power switch or breaker is opened.

BULLETIN IN PREPARATION

ADDITIONAL

Rota Safety Switch equipped with cable terminator, furnished for all types of cables. Standard pothead compound is used as insulating filler.

BULLETIN IN PREPARATION

FEATURES:

Dustproof due to glass enclosure
Safe distance from live parts to ground
Prevents operator from contact with live parts
Switch position, visual and indicator
Group operation of phases
Hand or electric operation
Handle, right or left hand
Operated by direct or remote control
Voltages 5 to 15 kv. amperes 200 to 1200
Poles 2, 3, 4, etc.
No live parts exposed in either open or closed position
No barriers required. Easily mounted.

ELECTRIC POWER EQUIPMENT CORPORATION

412 North 18th St. Philadelphia, Pa.

Since 1857

Better Tools for Tough Jobs

KLEIN'S

Your copy of the Klein Pocket Tool Guide will be sent on request.

ASK YOUR SUPPLIER

Climbing poles—keeping power and communication lines open is no easy task at best. Under war-time emergencies the job of the nation's linemen becomes increasingly tough.

But his knowledge and skill—his experience—the equipment he uses are the country's guarantee the job he does will be *well done.*

That these men prefer Klein pliers and tools, Klein belts and safety straps, Klein grips and climbers, is high testimony to the high quality of this equipment that has been serving America since 1857.

In the present emergency when tools and equipment are growing scarce, Kleins are proving their value in the years of service they give.

Foreign Distributor: **International Standard Electric Corp., New York**

Mathias KLEIN & Sons
Established 1857 — **Chicago, Ill., U.S.A.**
3200 BELMONT AVENUE, CHICAGO

meter men," Mr. Vaughen began his career at 17 when he left Baltimore, Md., his birthplace, to become a meter tester for the Thomson-Houston Electric Co., one of the parent companies of G. E., at West Lynn, Mass. This was in 1891.

He has been identified with meters ever since. Mr. Vaughen was given a gold-plated watt-hour meter, the 21,555,778th watthour meter made by G. E., last year in recognition of his more than a half century of service, and also received a 50-year certificate from the National Electrical Manufacturers Association, both presented at a banquet given in his honor at Swampscott, Mass. during the meter committee meetings of the Edison Electric Institute and the Association of Edison Illuminating Companies.

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▶ ROBERT J. O'CONNELL, formerly customer service representative for the Arkansas Power & Light Co. at Searcy, has been named division sales manager for the southeast division with headquarters at McGehee. Mr. O'Connell has been a member of the sales department staff since 1938.

▶ HENRY G. DOOLEY, an associate editor of ELECTRICAL WORLD since 1935, has been commissioned a lieutenant-commander in the U. S. Naval Reserve and has been assigned to active duty at a southern submarine base. Before assuming his editorial duties in New York Mr. Dooley had been connected with the executive department of the Florida Power & Light Co. and earlier in his career with Stone & Webster, Inc.

▶ WILLIAM L. HOOS, for the past ten years manager of the lighting exhibit of the Electrical Association of Philadelphia, has been appointed assistant to the president of the Council of Electric Operating Companies. Mr. Hoos will serve in the Washington office of the council with President Tom P. Walker. A graduate of the Friends School System, Mr. Hoos first was employed in the sales department of the Westinghouse Electric & Manufacturing Co. from 1911 to 1932, when he became manager of the Philadelphia exhibit.

▶ W. CULLEN MORRIS, vice-president of Consolidated Edison Co., has retired after serving system companies for 46 years. He was relieved of administrative duties in 1940, but was retained by the company to act as a consultant on special assignments, and has served for the past year and a half as chairman of the System Defense Committee. Because of his keen interest and experience in co-ordinating the companies' defense activities he has signified his

willingness to continue to assist the company in matters related to the war and defense situation. Mr. Morris was employed by the New York and East River Gas Co. and the New Amsterdam Gas Co. in 1896, a few months after his graduation from Stevens Institute of Technology as a mechanical engineer. He served for a number of years in engineering and executive capacities with the Consolidated Gas, Astoria Light, Heat & Power and the New York & Queens Gas companies. On the merger of the various gas and electric companies into the Consolidated Edison Co. in 1936 he continued as a vice-president.

▶ J. C. CAVIN, who until recently was division sales manager for the Mississippi Power & Light Co. in the Greenville area, has been transferred to Cleveland, where he now occupies the position of manager of the company's northern division. Mr. Cavin succeeds CLYDE V. HUSSEY, now with the Arkansas Power & Light Co. in Pine Bluff.

▶ W. H. HOLCOMB, formerly vice-president and general manager of the Pelton Water Wheel Co., San Francisco, Calif., has been appointed assistant to the executive vice-president of the Baldwin Locomotive Works. Mr. Holcomb started with the Pelton Water Wheel Co., a subsidiary of the Baldwin Locomotive Works, in 1919 as sales engineer. Later he was successively manager of the pump department, sales manager, vice-president and sales manager and since 1939 vice-president and general manager.

▶ FRANK A. HANSEN, regional illuminating engineer of the Ninth Regional Office of Civilian Defense, received the honorary degree of master of science from the University of Southern California at its recent annual commencement exercises in the Los Angeles Coliseum. Mr. Hansen has been prominent in western lighting circles for many years. He founded and is the managing director of the Western Institute of Light and Vision and is a regional vice-president of the Illuminating Engineering Society. In his present position he supervises all illumination activities relating to civilian defense.

▶ H. C. MADSEN has been appointed manager of technical employment and training for the Westinghouse Electric & Manufacturing Co. to succeed Major J. H. BELKNAP, who has entered the Army air service as a member of a permanent board in charge of the recruitment and placement of young officers. Mr. Madsen has been connected with the Westinghouse organization since 1936. In his new position he will direct the recruitment and training of college seniors who enter Westinghouse

American

LINE CONSTRUCTION BODIES

are doing their part to keep the lines open

The important but little dramatized part public utilities are playing in the battle of production is vital. The productiveness of every factory, the comfort of every home, depend on the constant maintenance of power and light services, on keeping communication lines open.

Here American bodies for motor vehicles are doing stalwart work. American all-steel bodies, scientifically designed, strong, lightweight, get to the job quicker, require less fuel, are easier on the tires, provide greater comfort and safety for the crews, and enable them to work more efficiently.

AMERICAN REPAIR PARTS TO KEEP THEM ROLLING

Now more than ever before utilities appreciate the value of American service. Repair parts in stock are quickly available for replacements and for repairing practically every type of American body.

A C & B

THE American COACH & BODY CO.

WOODLAND AVE. AT E. 93rd. ST., CLEVELAND, OHIO

PUBLIC UTILITIES EQUIPMENT FOR MOTOR VEHICLES

WHEN A MAN MUST REMEMBER...

to stay alive

Fourteen inches back of that barrier runs a high tension bus. Let a man forget to trip the controlling oil switch before opening that protecting door and he'd never forget again. But with this barrier, he *can't* forget.

To open the door equipped with a Bendix-Cory Type B-1496 Interlock he must have the key. And to release that key from its present location, he must open the line oil switch. Then, and only then, can he get at that bus.

Bendix-Cory Interlocks are built in dozens of types and designs to guard against the kind of habit or memory failure that means fatality. Write us for specific suggestions on the form of Interlock best suited to meet your current problems of protection.

MARINE DIVISION
BENDIX Aviation Corporation
1 Hanson Place, Brooklyn, New York

through its graduate student course. He also is responsible for the employment of technical personnel and for the scholarship activities of the company.

▶ F. C. HORSFORD, who has been connected with W. T. Henley's Telegraph Works Company, Ltd., Dorking, Surrey, England, since 1911, has been appointed engineering sales superintendent. For the past 20 years Mr. Horsford has served as engineering sales representative for the London district. F. V. VASSIERE, who entered the company's service in 1924, has been appointed an assistant sales manager to succeed the late A. T. Crowe.

▶ G. U. STEWART, formerly auditor of the Philadelphia Electric Co. system, has been appointed assistant to the vice-president in charge of finance and accounting. Mr. Stewart has been in the service of the Philadelphia utility since 1919. He is a native of Boston, Mass., and was graduated as an electrical engineer from the Massachusetts Institute of Technology. Before joining the Philadelphia Electric Co. he was employed as an engineer by a New England firm of consulting engineers.

OBITUARY

Samuel B. Tuell

Samuel B. Tuell, an executive of Engineers Public Service Co. and Engineers Public Service Co., Inc., since 1934, died on July 3 at his home in New York, after a short illness. He was 61 years of age.

Mr. Tuell entered upon his career in the public utility field shortly after graduation from the Massachusetts Institute of Technology in 1902, when he became identified with Stone & Webster at Boston. Subsequently he served as superintendent of Terre Haute Traction & Light Co., manager of Key West Electric Co., Key West, Fla., and of Blackstone Valley Gas & Electric Co., Pawtucket, R. I., and as manager of the Houghton County Electric Co., Houghton, Mich.

In 1925 he became Middle West district manager for Stone & Webster, supervising Mississippi River Power Co., Keokuk Electric Co., Fort Madison Electric Co., Paducah Electric Co., Dallas City Light Co., Houghton County Electric Co., Western United Gas & Electric Co. and Western Public Service Co., northern division.

One year later he was made vice-president of Engineers Public Service Co. and Engineers Public Service Co., Inc., and from 1930 to 1934 he served as president of General Public Service Corp.

Frank G. Frost

Frank G. Frost, general superintendent of the electrical division of the New Orleans Public Service, Inc., died on July 1, in his seventy-first year. He had been ill since May, when he suffered a heart attack in his office.

A native of Mattoon, Ill., Mr. Frost was graduated with a mechanical engineering degree from the University of Illinois. He went to New Orleans in

1918 from Houston, Tex., where he was general superintendent of the Houston Lighting & Power Co.

Mr. Frost was a past-president of the Electrical Association of New Orleans and the Louisiana Engineering Society and had been chairman of the local chapter of the A.I.E.E.

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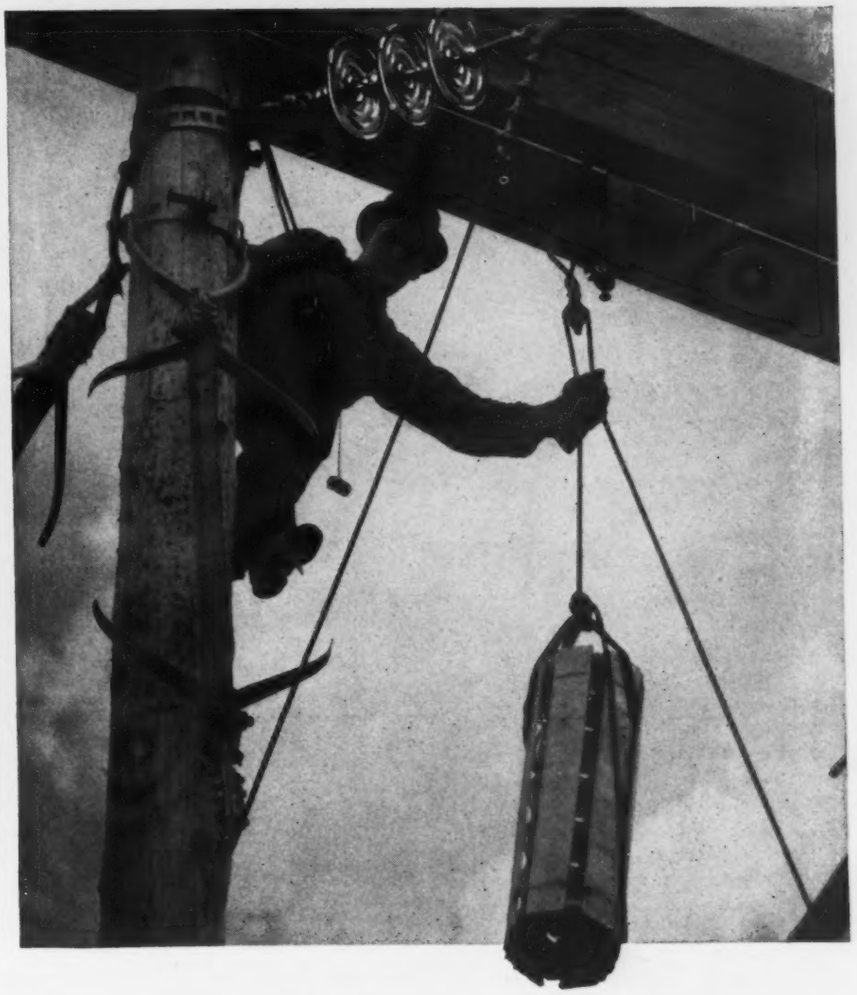
▶ WILEY ALFORD, widely known Alabama industrialist and formerly secretary-treasurer of the Alabama Power Co., died at his country home near Columbia, Ala., on June 9, after a long illness. He was 68 years old. In 1894 he entered the business world at Sheffield and was identified with steel and pipe industries there, in Birmingham and at Gadsden for many years. At the time Alabama Power Co. began its period of growth and development, he was employed as an accountant and advanced to the position of assistant treasurer in 1912 and secretary in 1913. From 1914 through 1918 he served as secretary-treasurer of the company. In 1919 he left the utility company to devote his time to the National Pipe & Foundry Co. of Attalla, which he founded and of which he was president. He was connected with several other Alabama industries and while retaining interests in those firms, he spent the last few years of his life at his home near Columbia, where he had large planting interests.



How Pyrex Insulators save man power

NO argument about the vital importance of saving man power these days! Time is money—and you save both when you use "Pyrex" Suspension units. Assembled strings of "Pyrex" Suspension Insulators come ready-to-hang in patented hinged crates that make your lineman's work easier, safer, and speedier. Here's all he has to do: Hoist the crated string up the pole . . . attach the cap of the top insulator to the pin . . . snip two banding wires to release the crate . . . then lower the crate. No unprotected, wriggling, dangling strings when you use these conveniently crated "Pyrex" Insulators.

But that's not all. High M & E strength of "Pyrex" Insulators usually makes double stringing unnecessary. And trouble-shooting is easier. No need to climb the pole to search for hidden cracks or breaks. If a "Pyrex" Insulator is hit with stones or rifle fire, the skirt is dropped, and the hub, plainly visible from the ground, holds securely until replacement is made.

LOW COST . . . There's a price advantage, too. "Pyrex" Suspension Insulators are 8% to 21% lower than competitive units, with one-price-to-all and no favorites.

If you are interested in saving man power, reducing initial cost, and at the same time getting insulators whose high dielectric and load strength, unusual arc resistance and weathering qualities make them tops in long-time performance—then Pyrex brand Glass is your answer. Mail coupon today for free booklet "The Dielectric Strength of Glass."

Pyrex Insulators
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Please send me my FREE copy of "The Dielectric Strength of Glass."

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MANUFACTURING-MARKETS

Urges Planning for Post-War Jobs

The unemployment period following cessation of present hostilities will be but a short transitional phase from war to peacetime production if post-war planning is well done, David C. Prince, vice-president of General Electric Co., stated before the closing general session of the National Industrial Advertisers' Association, which met recently in Atlantic City. Mr. Prince predicted an over-all shrinkage of 20 percent in manufacturing employment when the present war production program ends, but declared that proper planning should result in absorption quickly into fields relating to increased construction and sales effort.

War portfolios were submitted by 118 firms and 24 in three divisions were honored with awards. In the first division, for industrial advertising for the War Production Board and government agency assistance programs, an award went to Blaw-Knox Co., Pittsburgh. In the second division, for industrial advertising for today's war effort, an award went to Okonite Co., Passaic, N. J. In the third division, on "industrial advertising for the post-war period," Ajax Electrothermic Corp., New York, was cited.

Herbert Mercready, sales manager of the Magnus Corp., Garwood, N. J., was elected president of the association. He had been acting president in the place of W. D. Murphy, now in the Navy. Vice-presidents elected included W. H. Cordes, American Steel & Wire Co., Cleveland; A. H. Neher, Century Electric Co., St. Louis; Robert J. Barbour, Bakelite Corp., New York; J. A. M. Galilee, Canadian Westinghouse, Ltd., Hamilton, Ont.; H. S. Schuler, Westinghouse Electric & Manufacturing Co., San Francisco.

•

Change in Name Proposed

At a special meeting called for July 21 stockholders of Hygrade Sylvania Corp. will vote on a change in the corporate name to Sylvania Products, Inc. The change has already been approved by the officers and directors of the company. It will not affect basic operations or policies, but is described as a step in the company's long-term program in preparation for post-war developments.

•

Recruit Technical Staff for War Operations

Crosley Corp. is recruiting from its nationwide distributor organization the services of technically trained members to utilize in its war production operations.

In an effort to keep together its distributor organization and to man the rapidly expanding war production activities of the company, J. H. Rasmussen, manager of Crosley's appliance division, has made an appeal to all Crosley distributors to have all technical men in their organization who can be spared and who can qualify for positions with Crosley as draftsmen, expediters, production men, engineers and inspectors to apply for such work.

Mr. Rasmussen said: "We want to keep in the Crosley organization all of the people we can. When this emergency is over these people will be available to us for our over-all Crosley program."

WAR PRODUCTION CONFEREES—Members of electrical panel discussing material and power conservation problems at Boston recently, under WPB auspices. Points stressed included importance of earlier applications for increased power supply from utilities; specification of 208-volt motors for networks; training girls to handle electrical assemblies in lighter manufacturing; reducing transit loads through staggered hours; reallocation of underloaded transformers; the value of flexible industrial wiring systems; power-factor correction; electric welding controls and salvage of materials. In row one (l. to r.) E. S. Gunn, G.E.; E. W. Davis, Simplex Wire (chairman); A. F. Metzger, G.E.; H. E. Murphy, Stone & Webster (secretary). Row two—R. W. Adams, G.E.; C. A. Corney, Boston Edison; F. R. Benedict, Westinghouse; H. B. Richmond, General Radio, and W. H. Colburn, Boston Edison

Manufacturers Make Sales Assignments

Electrical manufacturers have recently announced the following assignments to their sales staffs:

Electrical Engineers Equipment Co., Chicago, has appointed H. B. Squires Co., San Francisco, to represent them in northern California and Nevada.

Trumbull Electric Manufacturing Co., Plainville, Conn., has appointed H. S. Farmilo field representative with headquarters in Baltimore, Md., where he will work with William J. Batchler.

•

Westinghouse to Expand Porcelain Department

To increase production by 30 percent, construction of two new buildings is under way for the porcelain department of the Westinghouse Electric & Manufacturing Co.

William F. Bailey, recently appointed manager of the department, stated that this expansion is necessary now because the manufacture of many new products, including war essentials, has been undertaken. "We are also looking ahead," Mr. Bailey said, "to the end of the war as a time when we will maintain high production schedules through the substitution of porcelain in many articles now made of plastic and metals. . . ."

•

Simplex Issues Booklet on Critical Materials

Simplex Wire & Cable Co., Cambridge, Mass., is distributing a 16-page folder reviewing the present status and outlook for critical materials used in cable and wire manufacture, emphasizing the slogan, "Wear it out," "Make it do," "Do without," and commenting on the situation in copper, rubber, tin, lead, steel and jute.

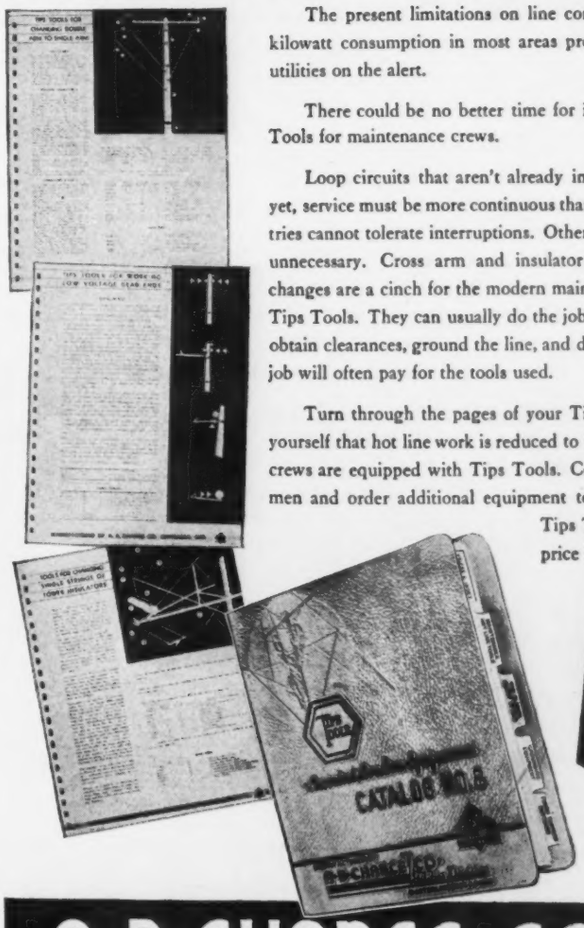
Restrictions upon the use of critical materials have further stimulated Simplex research activity, in which so much pioneer work has been done in such fields as the use of plantation rubber, accelerators and antioxidants, deproteinization of rubber and use of prevulcanized liquid latex for insulation. Under certain operating conditions the folder states, varnished cambric cables are a very satisfactory substitute for rubber insulated types.

•

Opens Providence Plant

Cornell-Dubilier Electric Corp. has announced the opening of a plant in Providence, R. I., which eventually will employ 800 to 1,000 persons, mostly women. Operations are under way.

Equip hot line crews while revenues are up and expansions are limited . . .



The present limitations on line construction and the increased kilowatt consumption in most areas presents a real opportunity for utilities on the alert.

There could be no better time for investment in Tips Hot Line Tools for maintenance crews.

Loop circuits that aren't already in are "out" for the duration, yet, service must be more continuous than ever before. Defense industries cannot tolerate interruptions. Other interruptions are costly and unnecessary. Cross arm and insulator changes or complete pole changes are a cinch for the modern maintenance crew equipped with Tips Tools. They can usually do the job in less time than it takes to obtain clearances, ground the line, and do the work cold, and a single job will often pay for the tools used.

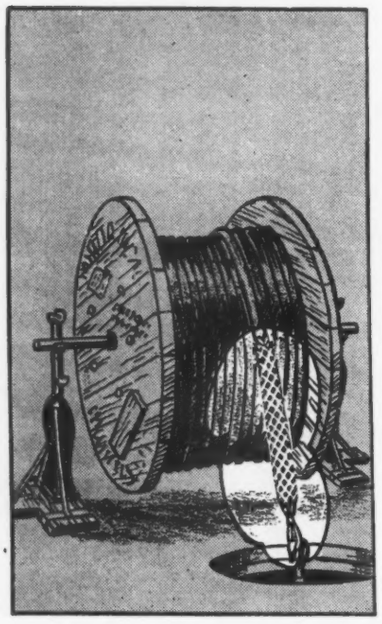
Turn through the pages of your Tips Tool Catalog and see for yourself that hot line work is reduced to its simplest, safest form when crews are equipped with Tips Tools. Confer with your maintenance men and order additional equipment today while revenues are up. Tips Tools are still available at no price increases.

CONSULT THIS BOOK

A·B·CHANCE CO.
CENTRALIA, MISSOURI.

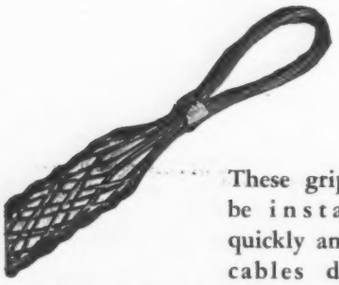
SPEED

CONSTRUCTION and EXPANSION of PLANT FACILITIES



RELIABLE CABLE GRIPS

For Pulling in Wires and Cable



These grips can be installed quickly and pull cables dependably. They do not let go halfway through a duct because the wires pull with evenly distributed load. Eight different styles — all supplied in a full range of sizes.

Reliable ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE • CHICAGO ILLINOIS

Field Reports on Business

Demand for a wide variety of electrical equipment for industrial uses continues at extremely high levels. Manufacturers are finding it difficult to keep pace with orders and extended delivery dates are prevalent. Retail sales continue their downward trend.

NEW YORK

Retail sales during the past week continued their downward trend in comparison with the corresponding week a year ago. Department store sales, according to the Federal Reserve Board, were off 8 percent for the week on a country-wide basis and 9 percent for the New York area. For the four-week period, however, sales register a 1 percent increase over the month's figures for the year previous.

Stock prices, which had shown gains with the Coral Sea and Midway news, surprisingly continued to advance despite the news of the critical situation in Libya. First official figures on U. S. production of war materials is thought to have had its firming effect on the securities markets.

Engineering construction volume for the week totaled $217,823,000, a gain of 37 percent over the preceding week, according to *Engineering News-Record*. The current week's construction brings the 1942 volume to $5,123,117,000, a gain of 76 percent over the 27-week period in 1941. Private work, $361,651,000, is 51½ percent below a year ago, but public construction is up 120 percent as a result of the 200 percent increase in federal work. Incidentally, as an indication of the trend, construction for the month of June reached $968,938,000, the second highest total in the country's history and tops for any June on record. Over 96 percent of the June work was for public construction, eclipsing last year's mark by 89 percent.

PACIFIC COAST

Priority for railroad freight is being discussed as a possibility, though so far, despite tremendous freight and passenger increase to coast ports, there has been no serious congestion.

Housing awards grow larger, necessarily, as recently completed plants are occupied and include a $6,250,000 award for 1,600 units in Tacoma, 2,000 units each in Vancouver, Wash.; Portland and San Pedro, averaging $4,000,000 each, and projected $10,000,000 to service new shipyards. Outstanding camp and base construction averages $10,000,000 each for Spokane supply depot, San Francisco Marine Corps facilities, Utah ordnance depot and a Pacific Island base. Sierra lumber mills have been busy supplying material for Jap relocation centers and quarters for 10,000 are to be built near Alhambra, Utah. Hospital construction, with its unusually high electrical proportion, includes a $-,250,000 naval hospital in Riverside County, Calif., $3,000,000 army hospitals near Spokane and Salt Lake City; a 1,500 bed $4,000,000 army hospital near Santa Fe; and considerable additions to several county hospitals in various western states.

Burbank, in southern California, area is planning a 10,000-kva. increase to its generating plant, helped by a $900,000 government allocation. Westinghouse's bid of 19 cents per gallon in tank cars was low for city of Lo- Angeles annual requirements of switch and transformer oil.

Varied orders include $20,000 capacitors, $85,000 switchgear and $25,000 of blower motors and controls for different switchyards, a 500-hp. motor and $20,000 transformers for an aluminum plant and a $15,000 motor-generator set for a drydock. Government machinery bids are temporarily small, typical being Westinghouse's low bid of $11,779 for a 3,000-kva. transformer for Bonneville system.

CHICAGO

The demand for a wide variety of electrical equipment for industrial uses continues at extremely high levels. Only the inability of manufacturers to make the equipment rapidly enough keeps sales from mounting higher and higher. Manufacturers' representatives report many an order lost because of extended delivery dates. With increasing production of war equipment using electrical apparatus and the large volume of new plant construction in progress, there is no immediate relief from the present situation in sight.

However, upon completion of most of the industrial plants by late this year or early next year the urgent need for heavy equipment will undoubtedly decline. Building permits in this area last month decrease 58 percent from a year ago. Residential building is way off except for several sizable defense housing projects, all in the $5,000 or under class. Most of these are outside the city where code restrictions are not so rigid.

The number of electrical permits issued in Chicago during May declined from 5,802 in May 1942 to 4,077. In June 2,886 additional outlets and 7,163 convenience outlets were installed, as compared with 3,484 additional outlets and 10,195 convenience outlets during May. During June 1941 the figures were 4,110 and 11,857, respectively.

NEW ENGLAND

New England industries are bending every effort to step up production in accordance with Washington requests to utilize all available agencies for increasing war material output. Small material deliveries and bookings of switch and control apparatus are moving steadily, notably in the machine tool trade.

Production peaks are being reached in prominent plants in this area; machine tool builders in Vermont and Rhode Island are operating at all-time records, and new production marks have been set by several Bay State industries.

Demand for industrial electric pumping units has quickened at the prospect of water shortages in several centers. Navy demands for wire and cable are urgent; a number of traffic signal orders have been placed for use on highways near Army training camps; inquiries for electric fans picked up during the past fortnight; Colonial Theatre in Boston has installed a new cooling system; dimout regulations along the East coast have stimulated the sale of shaded lamps and fittings; Museum of Fine Arts, Boston, is one of several public buildings that has installed shaded guide lamps for interior use during dimouts.

Wiring contracts for district circuit extension in Greater Boston industrial plants are in fair amount. Two traffic circles in the Fenway district of Boston will require new street lighting for traffic control.

Sales Opportunities

CALIFORNIA—Bureau of Power and Light, 207 South Broadway, Los Angeles, has authorized extensions in steel tower transmission line in El Monte district, estimated to cost over $85,000. Work will begin soon.

PENNSYLVANIA—War Department, Washington, D. C., has plans under way for new military cantonment in Western Pennsylvania. Complete electrical equipment and facilities will be installed for industrial and residential service. A power substation is planned. Cost estimated over $3,000,000. Gannett, Eastman & Fleming, Harrisburg, are architects and engineers. U. S. District Engineer Office, New Post Office Building, Pittsburgh, will supervise project.

MISSOURI—Municipal Light Department, Independence, plans extensions and improvements in electrical distribution system, including power substations, with installation of transformers, switchgear and accessory equipment. Application has been filed for a priority rating. Black & Veatch, 4706 Broadway, Kansas City, are consulting engineers.

MISSOURI—Pratt & Whitney Division, United Aircraft Corp., East Hartford, Conn., manufacturer of airplane engines and parts, will begin work soon on new plant to occupy a 240-acre tract in Missouri, for aircraft engine production for government. It will comprise a series of large one and multi-story buildings, with complete industrial electrical equipment. A main power substation is planned, with several auxiliary transformer stations. Cost estimated close to $75,000,000, with financing through Defense Plant Corporation. Albert Kahn Associated Architects & Engineers, Inc., New Center Building, Detroit, Mich., is architect and engineer.

NEW YORK—U. S. Engineer Office, 120 Broadway, New York, plans new power plant for service at government development in northern New York. Cost reported over $1,000,000. Backus, Crane & Love, 360 Delaware Avenue, Buffalo, are architects.

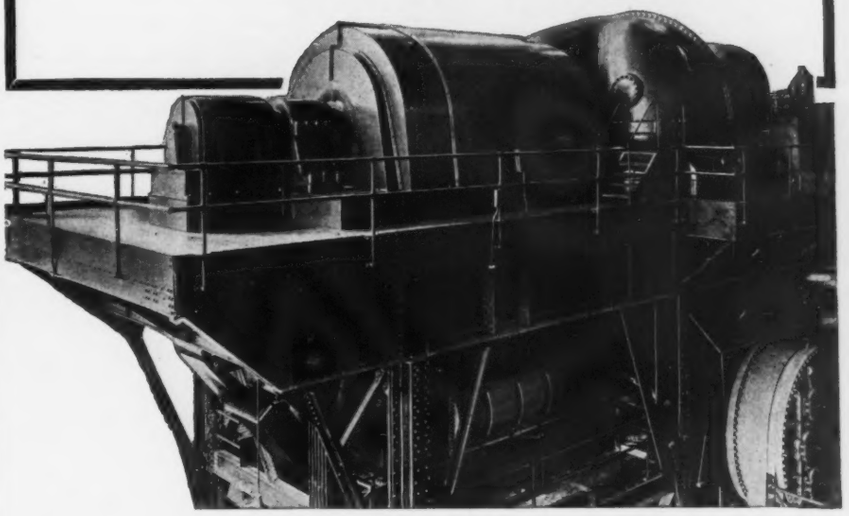
MASSACHUSETTS—Boston Edison Co., Boston, plans installation of underground conduit lines in connection with new power substation at Charlestown. Work on project will begin soon. Cost estimated about $230,000. Jackson & Moreland, Park Square Building, Boston, are architects.

TENNESSEE—War Department, Washington, D. C., has authorized construction of new air force training school. Complete electrical equipment and facilities will be installed for industrial, airfield and residential service. A power substation is planned. Cost estimated over $3,000,000. U. S. District Engineer Office, Nashville, will supervise project.

IDAHO—City Council, Lewiston, plans early call for bids for airport lighting system, including about 18,000 lin. ft. of conduit, 15,000 lin. ft. of electrical cable, 17,700 lin. ft. of copper wire, 80 contact, range and beacon lighting units, control equipment and other apparatus. W. P. Hughes is city engineer.

PENNSYLVANIA—United Engineering & Foundry Co., First National Bank Building, Pittsburgh, manufacturer of rolling mill equipment, rolls and other heavy machinery, will begin superstructure soon for

When it's gotta glow it's GOTTA glow!



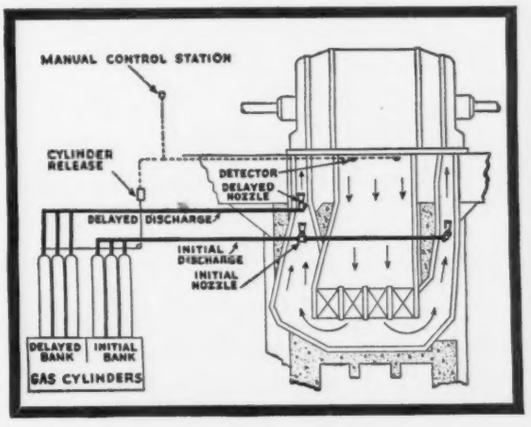
How to confine fire damage to point-of-rupture . . . kill flame and control glow

It's *flame* that does the damage to rotating electrical equipment. That's your *first* fire-fighting job. Nevertheless glowing embers of insulation must be controlled until the machine stops rotating. The fact is that, if *glow* is unchecked, *embers* may flare up at any instant.

Diagram shows how a Built-in Kidde extinguishing system kills flame in time to stop damage. At first sign of fire, Kidde nozzles flood entire machine and ducts with carbon dioxide gas. Fast-spreading Kidde gas spreads into every inch of space, kills flame instantly. Kidde carbon dioxide is one of fastest of all known extinguishing agents. Moreover, it is harmless to equipment.

Fire Control Lasts 30 Minutes

On a 30,000 K.V.A. generator a 12-cylinder Kidde System is used. Five cylinders kill flame during first few seconds. Seven remaining cylinders discharge for 30 minutes until machine runs down. This continuing concentration of carbon dioxide completely kills all carbonaceous "glow".



Manual Or Automatic

Differential relays or thermostats automatically release Kidde gas, shut off machine, at first sign of fire, or emergency manual controls snap the system into action when detectors indicate fire. Best practice combines both types of controls.

• • •

EXPLANATION — *Extinguisher nozzles, located in intake duct near underside of rotor, flood machine with carbon dioxide gas, kill flame instantly. Delayed discharge nozzles distribute sufficient gas to control glow during run-down period.*

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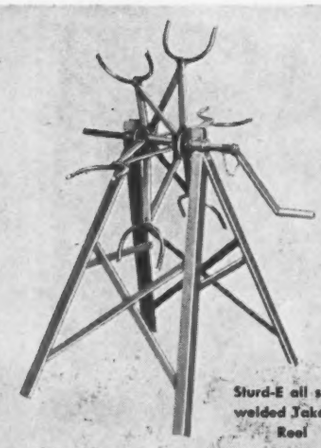

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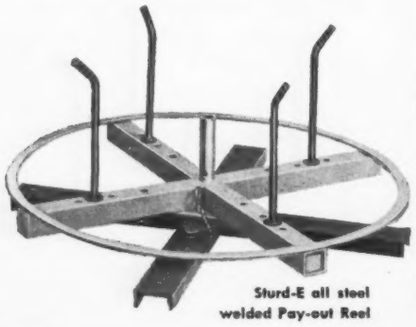

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new plant in western Pennsylvania, for production for government. It will comprise three main one and multi-story shops, with complete electrical operating facilities. Cost estimated close to $4,000,000.

WISCONSIN—Wisconsin Electric Power Co., Milwaukee, has submitted low bid for installation of power substation for Wisconsin National Guard, Camp Douglas, and is scheduled to secure award.

SOUTH DAKOTA—War Department, Washington, D. C., has authorized new military cantonment in South Dakota. Complete electrical equipment and facilities will be installed for industrial and residential service. A main power substation will be built and several smaller transformer stations. Cost estimated over $3,000,000. Hugill & Blatsurwick, Sioux Falls, are architects and engineers. U. S. District Engineer Office, Fort Peck, Mont., will supervise project.

LOUISIANA—Municipal Light and Water Department, Alexandria, plans improvements in municipal power plant, including three new superheaters and accessories, cooling tower and auxiliary equipment. Early purchase of apparatus is scheduled.

MICHIGAN—Detroit Edison Co., Detroit, plans further expansion in Marysville steam-electric generating station, where work is now under way on installation of new 75,000-kw. turbine-generator unit and auxiliary equipment, scheduled to be ready for service early next year. Immediately following, another generating unit of like rating will be installed, to be completed by close of 1943. Company has contracted for large additional power load in that area and will make extensions in transmission and distributing lines for this service in near future, including power substations and other operating facilities.

TENNESSEE—Tennessee Eastman Corp., Kingsport, manufacturer of acetate rayon products, staple fiber, etc., has contracted with government for construction and operation of new mill in Tennessee, consisting of several large processing and production units, with power substation and complete electrical operating facilities. Cost estimated over $3,000,000. U. S. District Engineer Office, Kingsport, will supervise project.

DISTRICT OF COLUMBIA—Potomac Electric Power Co., Washington, is arranging fund of about $3,000,000, through sale of stock, proceeds to be used for expansion and improvements in steam-electric power plant, where work is now under way on installation of equipment for increased capacity; also for expansion in transmission and distribution lines, power substations and other operating facilities.

KANSAS—War Department, Washington, D. C., has authorized construction of new air force training school in Kansas. Complete electrical equipment and facilities will be installed for industrial, airfield and residential service. A power substation is planned. Cost estimated in excess of $3,000,000. Black & Veatch, 4706 Broadway, Kansas City, Mo., are architects and engineers. U. S. District Engineer Office, Tulsa, Okla., will supervise project.

IOWA—Grundy County Rural Electric Cooperative, Grundy Center, plans extensions in primary lines, totaling about 60 miles, in connection with acquisition of power plant and distribution system of Iowa Utilities Co., at Lineville and in part of Mercer County, Mo. Fund of $118,000 has been secured through REA for project.

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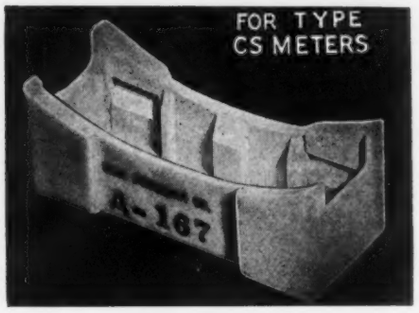

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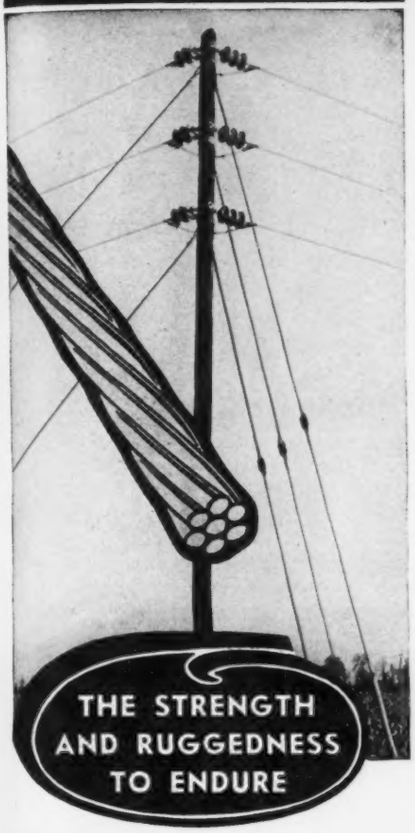

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REA Allotments Total $10,000,200

In announcing new allotments totalling $10,000,200, Rural Electrification Administrator Harry E. Slattery pointed out that, as with earlier allotments, no new construction will be undertaken except in accordance with authorization or regulation of the War Production Board.

The largest single allotment is $4,275,000 to the Sho-Me Power Cooperative of Columbia, Missouri, which when the war is over will bring the advantages of central station electricity to more than five thousand Ozark farmers. Of this sum approximately $2,500,000 will be expended immediately to finance the purchase of Missouri Electric Power Company.

The following allotments in South Central Texas, totalling $1,999,000, will permit the building of 1,200 miles of new distribution lines in the postwar period, as well as provide funds for the purchase and rehabilitation of rural distribution lines in the area which the cooperatives are now partially serving: Guadalupe Valley Electric Cooperative, $688,000; Medina Electric Cooperative, Inc., $509,000; Karnes Electric Cooperative, Inc., $417,000; Bandera Electric Cooperative, Inc., $385,000.

Among the other allotments are the following:

CALIFORNIA—Mountain Empire Electric Cooperative, Inc., Campo, L. N. Miller, supt., $18,000, to permit extension of service to a military unit and to complete a section of the system.

COLORADO—Southeast Colorado Power Assn., La Junta, E. G. Rash, mgr., $35,000 for construction and rephasing of line to serve military unit.

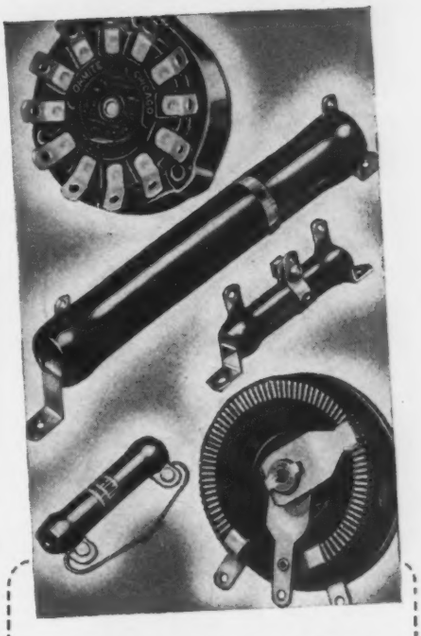
FLORIDA—Clay Electric Cooperative Assn., Inc., Keystone Heights, A. G. Loudon, supt., $55,000 to cover increased costs and connect members.

GEORGIA—Okefenokee Rural Electric Membership Corp., Nahunta, $26,000 to cover increased costs. Slashpine Electric Membership Corp., Homerville, $35,000 to cover increased construction costs.

IDAHO—Clearwater Valley Light & Power Assn., Inc., Lewiston, A. R. Mushlitz, supt., $76,000 to cover increased construction costs. Kootenai Rural Electrification Assn., Inc., Coeur D'Alene, Kenneth Lemley, supt., $32,000 for construction and rephasing of lines to serve a military unit, and to connect members.

INDIANA—Fayette-Union County REMC, Liberty, Alden Lewis, supt., $15,000 to connect 129 members. Hendricks County REMC, Danville, C. O. Stamper, supt., $15,000 to connect 129 members. Johnson County REMC, Franklin, Edgar Dorrell, mgr., $12,500 to connect 107 members. Morgan County Rural Electric Membership Corp., Martinsville, R. E. Judah, supt., $5,000 for installation loans for members. Clark County REMC, Sellersburg, H. C. Edwards, supt., $13,000 to connect 127 members.

IOWA—Maquoketa Valley Rural Electric Cooperative, Anamosa, E. D. Beach, supt., $32,000 to cover increased construction



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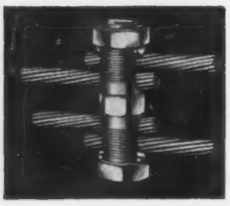

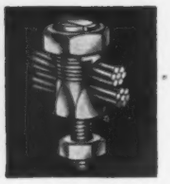

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costs and connect 200 members. Winnebago Rural Electric Cooperative Assn., Thompson, Glenn Bergland, supt., $16,000 to connect 150 members.

KANSAS—Central Kansas Electric Cooperative Assn., Inc., Great Bend, $125,000 for 176.5 miles of line, 310 members.

KENTUCKY—Meade County Rural Electrification Cooperative Corp., Brandenburg, C. H. Brown, supt., $300,000 for 197 miles of line, 1,510 members. Green River Rural Electrification Cooperative Corp., Owensboro, C. T. Smith, mgr., $132,000 for 90 miles of line, 607 members.

LOUISIANA—Concordia Electric Cooperative, Inc., Ferriday, E. B. Barnette, supt., $205,000 for 176 miles of line, 693 members.

MICHIGAN—Fruit Belt Electric Cooperative, Cassopolis, Robert Thompson, mgr., $30,000 to connect 300 members.

MINNESOTA—Tri-County Electric Cooperative, Rushford, Earl J. Kjos, mgr., $598,500 for 498 miles of line, 1,457 members. Minnesota Valley Electric Cooperative, Jordan, $20,000 to connect 160 members. Todd-Wadena Power and Light Coop. Assn., Wadena, Paul Richter, supt., $5,000 for installation loans for members. North Star Electric Cooperative, Inc., Baudette, $346,500 for 331 miles of line, 1,048 members.

MISSISSIPPI—Yazoo Valley Electric Power Assn., Yazoo City, E. L. Willett, supt., $15,000 to connect members.

MISSOURI—Northwest Missouri Electric Cooperative, Savannah, J. R. Lambright, supt., $10,000 to provide office headquarters building. Black River Electric Cooperative, Ironton, $5,000 for installation loans for members. Central Missouri Electric Cooperative, Inc., Sedalia, W. F. Schieberl, supt., $25,000 to complete a section of the system. Grundy Electric Cooperative, Trenton, $118,000, of which $37,750 is for purchase of facilities of Iowa Utilities Company, balance for construction of 60 miles of line, 183 members. West Central Electric Cooperative, Inc., Higginsville, Samuel Greer, supt., $15,000 to connect 158 members.

MONTANA—Big Flat Electric Cooperative, Inc., Turner, Drengman Simons, pres., $45,000 for acquisition of small community distribution lines and new construction. Sheridan County Electric Cooperative, Inc., Westby, A. T. Oleson, pres., $37,000 for acquisition of existing distribution lines and new construction. Northern Electric Cooperative, Inc., Opheim, Martin Sauber, pres., $45,000 for acquisition of existing distribution lines and new construction.

NORTH CAROLINA—Roanoke Electric Membership Corp., Rich Square, $13,000 to cover increased construction costs. Pamlico-Beaufort Electric Membership Corp., Grantsboro, $5,000 for installation loans for members.

OREGON—Nehalem Valley Cooperative Electric Assn., Jewell, S. S. Tanner, mgr., $20,000 to connect members. Malheur Cooperative Electric Assn., Vale, L. S. Heller, supt., $36,000 to connect members. Lane County Electric Cooperative, Inc., Oakridge, R. W. Buford, supt., $60,000 to provide generating facilities for the cooperative and the town of Oakridge.

PENNSYLVANIA—Southwest Central Rural Electric Cooperative Corp., Indiana, S. J. Orange, mgr., $18,500 to connect members. Jefferson Electric Cooperative, Inc., Brookville, H. A. Porter, supt., $12,000 to connect members.

SOUTH CAROLINA—Marion Electric Coop., Inc., Marion, L. T. Leitner, supt., $11,000 to cover increased construction costs. Marlboro Electric Cooperative, Inc., Bennettsville, E. W. Miller, supt., $27,000 to cover increased construction costs. York County Electric Cooperative, Inc., York, $10,000

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for additional construction cost of refrigerating plant.

TENNESSEE—Mountain Electric Cooperative, Mountain City, $35,000 to cover increased construction costs.

VIRGINIA—Mecklenburg Electric Cooperative, Chase City, E. H. Hart, supt., $3,000 to provide a substation.

WASHINGTON—Benton Rural Electric Assn., Prosser, J. B. Whitehead, mgr., $40,000 to connect members and cover increased construction costs.

WISCONSIN—Eau Claire Electric Cooperative, Eau Claire, $90,000 for 49 miles of line, 192 members. Dairyland Power Cooperative, Genoa, $883,200, of which $646,200 is to provide generating facilities and $237,000 to acquire existing facilities.

LETTER TO THE EDITOR

Clarify Neutral Sizes to Save Copper

To the Editor of ELECTRICAL WORLD:

In connection with the saving of copper by the electric industry, I believe that a clarification of neutral sizes would be helpful. For interior wiring the National Electrical Code covers neutral sizing, but their requirements do not seem to satisfy people who are designing electric wiring. The June 13 issue of ELECTRICAL WORLD, for example, contains an article by R. G. Hardy entitled "Check Wiring and Transformer Loadings to Maintain Production," in which it is stated that two-wire circuits would be benefited by conversion to three-wire circuits by the addition of a neutral conductor of smaller copper cross-section.

In this connection the National Electrical Code states that "for 3-wire d.c. or single-phase a.c. a further demand-factor of 70 percent may be applied to that portion of the unbalanced load in excess of 200 amp." Application of this provision will not generally result in the saving of much copper. Three-wire d.c. machines are generally designed for 10 or 15 percent unbalance. Distribution handbooks, such as the recent one published by General Electric Company, contain graphs and charts for secondaries which are based on similar small unbalance. In view of these it does not seem rational to design the wiring which is served by the generator or secondary for 100 percent unbalance, except in the case of larger conductors carrying over 200 amp.

Electric Light and Power, April, 1942, carries an article which I wrote on the use of reduced sized conductors for secondary neutrals. Most of the load for which a three-wire secondary service is designed is stove load; stove load is balanced load; therefore, most of the load is balanced load.

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I have tried to influence the WPB to make a study of neutral conductor sizes by a series of field measurements, but have been unsuccessful. At least one of the large electrical manufacturing companies is also inclined to show no interest in the study. At the present time we are facing a copper shortage, and it is my opinion that such a study should be made and made promptly so that the results can be used to save copper for the critical period ahead.

Summing up, I wish to state as follows: There is, at the present time, a useless waste of copper in the sizing of neutral conductors. An immediate study should be instituted to clarify this situation. Based on this study, code regulations and utility standards should be modified to conform with the conclusions of such a study. It is a foregone conclusion that such a study and the adherence to the results obtained from it would result in the saving of an appreciable amount of copper for the war effort and would result in more economic wiring.

ARTHUR L. BENNETT,
Hibbing, Minn.

•

Utility Abandons Efforts to Compromise Rate Case

Peter O. Knight, president of the Tampa Electric Co., stated in a letter to Chairman C. C. Watson of the Tampa Utility Board that no further effort will be made by his company to compromise electric rate litigation. Proposals of the utility to end rate litigation by adopting the present rates in force in either Jacksonville or Miami, Fla., were rejected by the Tampa Utility Board.

"We have endeavored in every way possible for three years to compose the differences between us, but we have met with a wet blanket in every respect." President Knight said in his letter, which was published as an advertisement. "We will push completion as rapidly as possible of the pending suit before the courts . . ."

The letter reviewed the creation of the utility board, its order for a 30 percent reduction in electric rates, the court suit, and the company's recent offer to compromise on the basis of rates in Miami or in Jacksonville.

•

Builds New Boiler Unit

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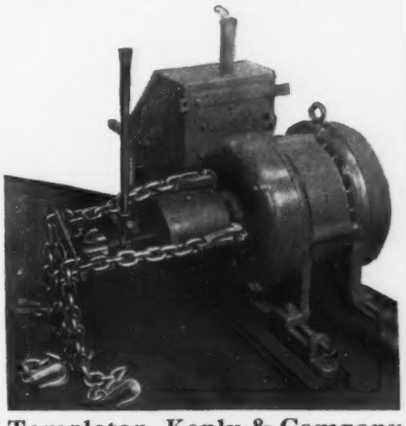

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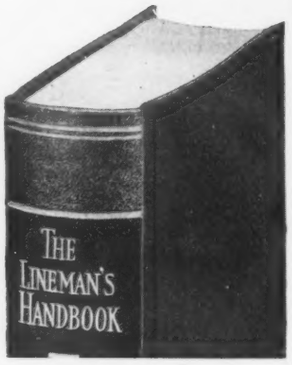

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